

Stockpile Report to the Congress

April — September 1984



**FEDERAL EMERGENCY
MANAGEMENT AGENCY**



Federal Emergency Management Agency

Washington, D.C. 20472

Honorable George Bush
President of the Senate

Honorable Thomas P. O'Neill, Jr.
Speaker of the House of Representatives

Sirs:

The Strategic and Critical Materials Stock Piling Act, as amended, provides that strategic and critical materials be stockpiled in the interest of national defense to preclude a costly and dangerous dependence upon foreign sources of supply in times of national emergency.

The President delegated stockpile policy and planning activities to the Director of the Federal Emergency Management Agency. This Stockpile Report to the Congress for April-September 1984 is submitted in accordance with Section 11 of the Stock Piling Act.

Sincerely,

A handwritten signature in black ink, appearing to read "Giuffrida".

Louis O. Giuffrida
Director

INTRODUCTION

This report is prepared in accordance with Section 11 of the Strategic and Critical Materials Stock Piling Act (P.L. 96-41, 50 U.S.C. 98 *et seq.*). The organization of the report is designed to present the information required to be reported by the Act, which includes:

- (1) information with respect to foreign and domestic purchases of materials during the preceding 6-month period;
- (2) information with respect to the acquisition and disposal of materials by barter pursuant to Section 6(c) of the Act, during such period;
- (3) a statement and explanation of the financial status of the National Defense Stockpile Transaction Fund and the anticipated appropriations to be made from the Fund during the next fiscal year; and
- (4) such other pertinent information on the administration of the Stock Piling Act as will enable the Congress to evaluate the effectiveness of the program provided for under the Act and to determine the need for additional legislation.

Consistent with these statutory requirements, this report is divided into four major sections:

- I. Stockpile Acquisition and Disposal Program;
- II. Stockpile Barter Program;
- III. Financial Status of the National Defense Stockpile Transaction Fund; and
- IV. Administration of the Stockpile Program.

Appendixes present detailed information on:

- The current inventory of materials in the National Defense Stockpile, with a key to abbreviations used in quantity measures and a description of materials offsets;
- An explanation of calculation procedures for family groupings of stockpile materials, including a listing of conversion factors; and
- A reference copy of the Strategic and Critical Materials Stock Piling Act, as amended.

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HIGHLIGHTS

I. STOCKPILE ACQUISITION AND DISPOSAL PROGRAM

- Contracts totaling \$57.1 million were awarded for the purchase of bauxite, beryllium, cobalt, nickel, quinidine, and vanadium.
- Disposals of 13 excess stockpile materials with a total value of \$41.5 million were accomplished through sales contracts.

II. STOCKPILE BARTER PROGRAM

- There were no new barter agreements negotiated during the report period. The stockpiling of Jamaican bauxite was completed according to previous agreements.

III. FINANCIAL STATUS OF THE NATIONAL DEFENSE STOCKPILE TRANSACTION FUND

- Receipts of \$458.7 million from the sale of excess stockpile materials have been credited to the National Defense Stockpile Transaction Fund since its inception in 1979.
- Obligations totaling \$358.5 million have been made from the Transaction Fund to acquire materials for the Stockpile.
- The balance in the Transaction Fund, as of September 30, 1984, consists of \$39.7 million authorized by Congress for purchases of materials for the Stockpile and \$60.5 million in currently unappropriated funds.

IV. ADMINISTRATION OF THE STOCKPILE PROGRAM

- The current Stockpile inventory is valued at \$10.4 billion, of which \$7.1 billion is held against Stockpile goals. Current Stockpile goals would require \$17.0 billion of materials. To meet current goals an additional \$9.9 billion of materials would be required.
- An interagency stockpile study, chaired by the NSC, could affect future stockpile goals.
- During the period, germanium (a byproduct of zinc) was added to the list of strategic and critical materials. A goal of 30,000 kilograms was established.

I. STOCKPILE ACQUISITION AND DISPOSAL PROGRAM

Acquisitions of Goal Materials

For Fiscal Year 1984, Congress approved \$120 million in new obligational authority for the acquisition of materials for the National Defense Stockpile inventory. Carryover authority from Fiscal Year 1983 was \$11.0 million and recoveries of prior year obligations are \$17.2 million, for a total of \$148.2 million available for the purchase of materials during the period starting October 1, 1983.

As presented in Figure 1, contracts for the purchase of six commodities, at a total delivered cost of \$57.1 million, were awarded during the report period. This brings total purchases from the fund for Fiscal Year 1984 to \$108.8 million. The Stockpile also acquired a quantity of jewel bearings under a continuing arrangement with a production facility owned by the U.S. Government.

Figure 1
Acquisitions of Stockpile Materials
April 1, 1984-September 30, 1984

Material	Unit	Quantity	Cost	Origin
Stockpile Transaction Fund				
Bauxite, Refractory	LCT	75,000	\$ 11,112,125	Peoples Republic of China
Beryllium, Metal	ST	30	13,467,000	Domestic
Cobalt	LB	500,000	5,850,000	Canada
Nickel	ST	5,000	24,246,000	Canada, Norway
Quinidine Sulfate	OZ	400,000	1,590,362	Netherlands
Vanadium Pentoxide	ST	80	842,520	Domestic
Total Obligations From Transaction Fund			\$57,108,807	
Other				
Jewel Bearings	PC	1,067,038	\$ 1,548,210	
Total Cost of Materials			\$58,657,017	

Beryllium: GSA negotiated for 60,000 pounds of hot-pressed beryllium billets from Brush Wellman, Inc., a Utah mining company that is the sole commercial supplier of beryllium metal. The company is expected to deliver over 20 billets (large cylindrical blocks of solid metal) during Fiscal Year 1985 to satisfy the contract that is valued at \$13,467,000. Metallic beryllium offers light weight, high strength, and stiffness (for aerospace parts),

specialized nuclear properties (for collecting neutrons and passing x-rays), and the ability to dissipate heat rapidly (for aircraft brakes).

Cobalt: GSA made its third purchase of cobalt during the period. The 1981 and 1983 acquisitions were from Zaire and Zambia; this award was made to International Nickel (INCO) for Canadian material. INCO's bid for 500,000 pounds at

\$15,850,000 was considered reasonable under the terms of the Trade Agreements Act. Cobalt is essential for the metallic alloys used to fabricate some rotating parts in jet engines.

Nickel: The largest purchase for the period was nickel. Two awards were made totaling approximately \$24.2 million. Falconbridge U.S. received an award valued at \$14,452,000 for 3,000 short tons of Norwegian electrolytic metal, and the International Nickel Company was awarded a contract to supply 2,000 short tons of Canadian pellets for \$9,794,800. Nickel, like cobalt, is required in jet-engine alloys, and is also suitable for corrosion-resistant pipes at industrial processing facilities.

Quinidine Sulfate: Medical quality sulfate has been ordered from R. W. Greef and Company. This powdered medicine is produced in the Netherlands and is used in regulating abnormal heartbeats. A total of 11,300 kilograms of quinidine sulfate will be delivered to the Stockpile. The value of the contract was \$1,590,362.

Refractory Bauxite: Two separate awards were made to Cometals, Inc., for material from the Peoples Republic of China. The first was for 50,000

long calcined tons (LCT), at \$7,292,500; and the second was for 25,000 LCT at \$3,819,625. Refractory bauxite has a high alumina content, making it ideal for fabricating into ultra-high-temperature furnace linings.

Vanadium Pentoxide: An \$842,520 contract was awarded to the Umetco Minerals Corporation of Danbury, Connecticut, for 285,600 pounds of contained vanadium pentoxide. This concentrate will be produced in Rifle, Colorado. Vanadium is used principally as an alloy in steel and titanium to impart strength.

Disposals of Excess Inventory

As detailed in Figure 2, a total of 13 excess commodities valued at \$41.5 million were disposed of during the period, bringing total disposals for the fiscal year to \$71.5 million (includes cash sales and disposals to finance the ferroalloys upgrade program). Major disposals were: industrial diamond stones, chemical grade manganese, tin, and tungsten ores and concentrates. These four materials represented 91 percent of total disposals for the period.

Figure 2
Disposals of Excess National Defense Stockpile Materials
April 1, 1984 September 30, 1984

Material	Unit	Sales During Period Value	Quantity	Balance of Disposal Authority (Quantity)
Antimony	ST	\$	0	
Asbestos, Amosite	ST		30,024	
Asbestos, Crocidolite	ST		831	
Asbestos Chrysotile	ST		2,000	
Celeslite	SDT	-	13,415	
Diamond Industrial, Crushing Bort	KT		1,354	
Diamond Industrial, Stones	KT	10,623,992	977,864	38,084
Kyanite	SDT		1,187	
Iodine	LB	370,360	78,800	1,172,284
Manganese Dioxide, Battery Grade, Natural Ore	SOT	272,297	3,340	73,956
Manganese Ore Chemical Grade	SDT	1,647,610	19,847	101,914
Manganese Ore Metallurgical Grade	SDT			666,246
Mercuric Oxide	LB	635,128	227,200	467,953
Mercury	FL	691,025	2,292	32,832
Mica Muscovite Block Stained & Lower	LB	"		50,000
Mica Muscovite Film, 1st & 2nd Qualities	LB			35,027
Mica Muscovite Splittings	LB	774,438	1,735,732	2,607,812
Mica Phlogopite Splittings	LB	58,368	72,654	634,707
Quartz Crystals	LB	160,180	112,446	1,683,878
Rare Earth Oxides	SDT			487
Talc Steatite Block & Lump	ST	"		866
Talc, Ground	ST			1,089
Thorium Nitrate	LB			6,055,529
Tin	LT	15,080,063	1,171	20,327
Tungsten Ores & Concentrates	LB W	10,440,285	2,148,656	50,968,013
Vegetable Tannin Extract, Chestnut	LT	273,385	403	4,539
Vegetable Tannin Extract, Quebracho	LT	456,085	668	82,886
Total Sales During Period		\$41,483,816		

Total sales include \$18,893,775 to finance the ferroalloys upgrade program

Industrial Diamond Stones: The market continues to readily absorb the excess diamond stones as reflected in the sales this period totaling 977,864 carats, valued at \$10.6 million. Diamonds are offered for sale three times a year at a fixed rate of 500,000 carats. In the two sales this period 98 percent of the available quantity was sold. The average unit value rose 29 percent from the previous period.

Chemical Grade Manganese: Approximately 19,847 short tons valued at \$1.6 million were sold this period. The Stockpile inventory for chemical grade manganese now stands within one percent of the goal. This concludes the sales program for chemical grade manganese until new disposal authority is received.

Mica: Sales of mica splittings (muscovite and phlogopite) amounted to more than 2.5 times those reported for the previous reporting period. One of the contributing factors to this large increase was the dock strike in India which occurred earlier this year. Since India is the major source of mica, this

strike caused traders to seek the material from alternate sources, and, thus, increased Stockpile sales. Although the strike was settled prior to this reporting period, the supply lines will take some time to readjust. Once this happens, it is anticipated that Stockpile sales will drop.

Tin: Tin disposals were up 25 percent to 1,190 metric tons for this period. All but 35 metric tons were used as exchange material for the ferroalloy upgrading program.

Tungsten Ores and Concentrates: The current level of disposal of tungsten represents a continued increase of 26 percent over the previous period. The increased demand is a result of the economic recovery. During the first part of the period, demand for tungsten in all sectors was high but then dropped off in the latter part, as companies worked off their excess stocks.

II. STOCKPILE BARTER PROGRAM

Between 1950 and 1967, the U.S. Department of Agriculture (USDA) conducted a barter program under which 60 strategic and critical materials, with a value of more than \$1.6 billion, were acquired from more than 50 different countries. These materials were bartered for agricultural commodities owned by the Commodity Credit Corporation (CCC), USDA. The last barter contract under that program was signed in 1967.

On January 17, 1984, the Emergency Mobilization Preparedness Board was tasked by the President as the senior body to review barter proposals or policies. The U.S. policy on barter will continue

to be as stated in the President's National Materials and Minerals Program Plan and Report to Congress:

The Administration will rely primarily upon purchases on the open market to build the nation's stockpile...We will use exchanges and barter to acquire additional stockpile materials when in the best interests of the country.

There were no new barter agreements negotiated during the report period.

III. FINANCIAL STATUS OF THE NATIONAL DEFENSE STOCKPILE TRANSACTION FUND

Proceeds from the sale of excess stockpile materials are placed in the National Defense Stockpile Transaction Fund established under Section 9 of the Strategic and Critical Materials Stock Piling Act. The disposals of excess materials from inception of the Fund in Fiscal Year 1979 through September 30, 1984, have a total value of \$418.8 million, as

detailed in Figure 3. Receipts from such sales transferred into the Fund have totaled \$458.7 million. Sales of excess materials prior to July 30, 1979, for which the proceeds were received after that date, and adjustments due to over and under shipments of disposal contracts, account for the difference between receipts and sales dollars.

Figure 3
Cumulative Disposals of Excess Stockpile Materials
July 30, 1979-September 30, 1984

Material	Unit	Quantity	Value
Antimony	ST	1,884	\$ 2,798,830
Asbestos, Chrysotile	ST	1,000	1,493,830
Celestite	SDT	1,000	1,000
Diamond, Industrial, Crushing Bort	KT	2,375,123	5,196,183
Diamond, Industrial, Stones	KT	5,961,915	77,153,256
Kyanite	SDT	300	30,000
Iodine	LB	640,688	3,582,889
Magnesium	ST	362	763,820
Manganese Dioxide, Battery Grade, Natural Ore	SDT	52,159	3,911,925
Manganese Ore, Chemical Grade	SDT	49,238	3,991,986
Mercuric Oxide	LB	182,300	527,448
Mercury	FL	15,668	5,179,697
Mica Muscovite Film 1st & 2nd Quality	LB	99,826	339,741
Mica Muscovite Splittings	LB	5,941,117	4,161,268
Mica Phlogopite Splittings	LB	1,249,555	1,151,822
Quartz Crystals	LB	513,552	1,744,754
Rare Earth Oxides	SDT	702	533,000
Rubber	LT	646	469,343
Silver	Tr Oz	2,000,000	18,123,325
Talc, Steatite Block & Lump	ST	10	4,000
Thorium Nitrate	LB	26,875	63,599
Tin	LT	13,552	195,935,149
Tungsten Ores & Concentrates	LB W	11,126,398	76,231,819
Vegetable Tannin Extract, Chestnut	LT	3,993	2,609,117
Vegetable Tannin Extract, Quebracho	LT	18,916	11,896,209
Vegetable Tannin Extract, Wattle	LT	1,350	940,749
Total Sales Since July 30, 1979			\$418,834,759

Since inception of the Fund, Congress has approved the use of \$398.3 million to purchase Stockpile materials, leaving an unappropriated balance of \$60.4 million in the Fund, as of September 30, 1984. Of the \$398.3 million available, a total of \$358.5

million has been obligated through September 30, 1984, to finance the purchase of needed Stockpile materials from numerous world sources. The cumulative obligations are shown in Figure 4.

Figure 4
Cumulative Obligations from the National Defense Stockpile Transaction Fund
July 30, 1979-September 30, 1984

Material	Unit	Quantity	Cost	Origin
Bauxite, Metallurgical Grade	LDT	3,600,000	\$122,369,000	Jamaica
Bauxite, Refractory	LCT	100,327	15,003,000	China
Beryllium	ST	120,000	27,865,000	Domestic
Cobalt	LB	12,200,000	119,683,000	Various ^a
Iridium	Tr Oz	10,800	3,926,000	South Africa
Nickel	ST	5,000	24,247,000	Canada, Norway
Quinidine	Av Oz	671,983	2,532,000	Netherlands
Rubber	LT	398	418,000	Various ^b
Tantalum Minerals	LB Ta	282,883	11,409,000	Various ^c
Titanium Sponge	ST	4,500	29,387,000	Various ^d
Vanadium	ST V	181	1,696,000	Domestic
Total Obligations			\$358,535,000	

^a Canada, Zaire, Zambia.

^b Malaysia, Indonesia, and Thailand.

^c Brazil, Australia, Germany, Thailand, the Netherlands, Zaire, Mozambique, Nigeria, Malaysia, Canada, Rwanda, Zimbabwe, South Africa, Namibia, Singapore, Spain, Portugal, China, and Argentina.

^d Japan, United Kingdom, and the United States.

The financial status of the National Defense Stockpile Transaction Fund from its inception is summarized in Figure 5. The unobligated balance of the Transaction Fund, as of September 30, 1984, is \$100.2 million. Of this total, \$39.7 million has

been authorized by Congress to be obligated for the purchase of materials for the Stockpile. An additional \$60.5 million from current receipts in the Transaction Fund is available for future purchases of materials when authorized by Congress.

Figure 5
Financial Status of the National Defense Stockpile Transaction Fund
July 30, 1979-September 30, 1984
(Millions of Dollars)

Period	Receipts	Purchase Authority	Obligations	Balance In Fund (End Date)
August 1, 1979 to September 30, 1979	\$ 7.3	0	0	\$ 7.3
October 1, 1979 to September 30, 1980	87.0	0	0	94.3
October 1, 1980 to September 30, 1981	99.2	\$100.0 0.4 ^a	\$78.0	115.5
October 1, 1981 to September 30, 1982	161.0	57.6 0.3 ^b	44.0	232.5
October 1, 1982 to September 30, 1983	53.2	120.0	145.0	140.7
October 1, 1983 to September 30, 1984	51.0	120.0	108.9 (17.4) ^c	100.2 ^d
Totals	\$458.7		\$398.3	\$358.5

^a Consists of approximately \$400,000 in authority for the rotation of rubber under Section 6(a)(4) of the Stock Piling Act.

^b Consists of approximately \$300,000 in authority for the rotation of chrysotile asbestos under Section 6(a)(4) of the Stock Piling Act.

^c The amount of \$17,387,000 was deobligated during the reporting period to effect adjustments to previously estimated obligations for transportation costs on the bauxite purchase and the current bauxite barter agreement.

^d Includes \$39.7 million that is authorized to be obligated and \$60.5 million from current receipts that will require future authorization before obligation.

IV. ADMINISTRATION OF THE STOCKPILE PROGRAM

Overview

The Strategic and Critical Materials Stock Piling Act provides that a stock of strategic and critical materials is to be maintained to decrease dependence upon foreign sources of supply in times of national emergency. Executive Order 12155 vests the responsibility for planning the stockpile program in the Director of the Federal Emergency Management Agency (FEMA).

The Stock Piling Act requires that the stockpile inventory be sufficient to cover U.S. needs for not less than 3 years of a national emergency. The President approves stockpile policy guidance assumptions regarding changes in a wartime civil economy, wartime foreign trade patterns, shipping losses, wartime political and economic stability of foreign nations, and foreign and domestic production levels for stockpile materials.

These guidelines are followed in determining the stockpile goals which represent the difference between estimated supply and projected requirements for each strategic material. Periodic review and updating of the goals are required to ensure a current estimate of our Nation's vulnerability to resource shortages during an emergency.

New Material Added to List of Strategic and Critical Materials

During the period under review, a new material, germanium, was added to the list of strategic and critical materials. This determination was made by the Director of FEMA after an extensive interagency supply-requirement review. The review identified a substantial shortfall between supply and requirements during a national emergency. The principal use of germanium is in the production of lenses and windows for infrared optical devices. Other uses include fiber optic applications and special-property semiconductors. During a national emergency there would be a significant increase in the demand for germanium in these applications.

Germanium is derived as a byproduct of a few select metal residues provided by the zinc industry. Most zinc residues do not contain sufficient germanium to permit recovery. For this reason, opportunities for emergency expansion would be relatively limited.

Stockpile Study

An interagency stockpile study is currently underway. The study group is chaired by the National Security Council. Results from this study could impact future stockpile goals.

ANNUAL MATERIALS PLAN

Pursuant to Section 11(b) of the Strategic and Critical Materials Stock Piling Act, the management plan for restructuring the inventory of the stockpile is provided through the development of the Annual Materials Plan (AMP). The AMP is the product of a major interagency effort that develops an annual list of acquisition and disposal actions for stockpile materials. The AMP process is conducted within the framework of the AMP Steering Committee, an advisory group to the Director of the Federal Emergency Management Agency (FEMA). The AMP Steering Committee is chaired by FEMA and includes as designated members the Departments of Agriculture, State, Commerce, Defense, Energy, the Interior, and the Treasury, and the Central Intelligence Agency, the General Services Administration (GSA), the National Security Council (NSC), and Office of Management and Budget (OMB). The AMP is developed in a manner that balances National Defense Stockpile requirements against the need to avoid undue market disruption and to conform with budget limitations.

The AMP process is initiated within the Resources Preparedness Office of FEMA, which provides a list of goals, shortfalls, excesses, and priorities to GSA. After an evaluation of the market outlook, the Office of Stockpile Transactions of GSA proposes quantities of commodities for acquisition or

disposal. These proposals are provided to the two subcommittees described below, which furnish their suggested revisions to the full AMP Steering Committee.

The Strategic Implications Subcommittee is chaired by the Department of Defense and includes as other designated members, the Central Intelligence Agency, the Department of Energy, and FEMA. The primary function of this subcommittee is to determine if any of the materials proposed for the AMP will be affected by anticipated changes in defense requirements.

The Market and International Political Impacts Subcommittee is co-chaired by the Departments of Commerce and State with the other designated members being the Departments of Defense, the Treasury and the Interior, and FEMA and GSA. Under the leadership of Commerce, this subcommittee evaluates, on a case-by-case basis, the effects that stockpile acquisitions and disposals will have upon domestic and international markets. Significant trends and areas where stockpile activities could lead to a commodity market disruption are examined. This subcommittee develops market impact statements with assistance from the Departments of the Interior (Bureau of Mines) and Commerce (International Trade Administration).

Under the leadership of the Department of State, this subcommittee also determines the international economic and political impacts of stockpile acquisitions and disposals. In particular, the subcommittee determines the impact that stockpile activities could have on earnings of international producers and producer countries, on international trade patterns, and on international agreements.

The results of these analyses are presented to the AMP Steering Committee, which develops a recommended AMP. The AMP is submitted to the Director of FEMA for approval and by the Director to the NSC for review. Simultaneously, an information copy is provided to OMB. Any revisions to the initial AMP each year are made jointly by the NSC and FEMA. The AMP is then submitted by the Director of FEMA to the House and Senate Armed Services Committees.

The AMP for Fiscal Year 1985 was submitted to the Congress in February 1984. The plan contains proposed acquisitions and disposals of stockpile materials for Fiscal Year 1985 and estimates of those activities for the 4 forward years (Fiscal Years 1986-1989). Information on the specific materials and associated quantities for acquisition and disposal remains classified until invitations to bid are announced.

During the period covered by this report, FEMA submitted to the House and Senate Armed Services Committees two amendments to the Fiscal Year 1984 AMP. These revisions were needed to accommodate changes in the market conditions for several commodities that had occurred subsequent to submission of the AMP the previous year.

LEGISLATION

Appropriations

The appropriations bill for National Defense Stockpile Operations including funds for acquiring new materials was not passed prior to the end of this report period. As proposed it includes \$185 million in obligational authority for the Transaction Fund to be used to purchase strategic and critical materials. It also includes the following provision: "Provided that none of the funds appropriated by this paragraph may be used to purchase any strategic and critical materials for the National Defense Stockpile that is not mined and refined in the United States; provided further, that the paragraph shall only apply to those strategic and critical materials that are currently mined or refined in the United States or which can be produced domestically at the levels and quantities required by the Federal Emergency Management Agency."¹¹

The Senate DoD Appropriations Bill for Fiscal Year 1985 included a provision which would have restricted sales of silver from the stockpile until the Administration filed a report on this issue. Funding for DoD was also included in the Continuing Appropriations Bill for Fiscal Year 1985, and this restriction on silver sales was deleted during the

conference meeting. However, conferees did note in the report language that existing law must be followed with respect to the disposal of silver from the stockpile.^{1/}

Authorization for Acquisitions and Disposals

The proposed DoD authorization bill for Fiscal Year 1985 includes disposal authority for 19 materials, including 10 million ounces of silver; a limitation on the unobligated balance in the Stockpile Transaction Fund from \$500 million to \$250 million in FYs 1985 and 1986 and to \$100 million in FY 1987; authorization of 30 percent of all money accruing to the United States during FY 1985 from lands in the Naval Petroleum Reserves (less exploration, development, operation, and related expenses) to be credited to the National Defense Stockpile Transaction Fund; and a requirement that the President submit a report to Congress on stockpile activities by January 31, 1985. This bill had not been passed by the end of the report period.^{2/}

^{1/} *The Treasury, Postal Service, and General Government Appropriations Bill were subsequently included in the continuing appropriations bill for FY 1985 which was signed by the President on October 12, 1984, Public Law 98-473.*

^{2/} *The FY 1985 DoD Authorization Bill was signed by the President on October 19, 1984, Public Law 98-525.*

Section 711 of the Act previously authorized appropriations for such sums as might be necessary to carry out provisions of the Act. It set no specific authorization amount. With respect to Title III this has now been modified. Section 711 now authorizes appropriations in the total amount of \$100 million for FYs 1985 and 1986. The authorization for FY 1985 is, however, \$25 million. This amount has been included in the 1985 DoD budget.

The Act, as amended, now requires that the President make a determination that a Title III project, including guarantees, loans, and commitments to purchase, is essential to the national defense and that without this project U.S. industry cannot reasonably be expected to provide for the needed materials or services in a timely manner. Further, additional findings must also be made, including findings on cost effectiveness.

Except during a national emergency, the new provisions require that Title III projects be identified in the President's budget, or amendments thereto, and be accompanied by a statement demonstrating that the submission is in accordance with the requirements set out in the new sections dealing with Presidential determinations. The project may be undertaken only after 60 days have elapsed after the budget submission has been made. Further, if the project would cause the aggregate outstanding for guarantees, loans, or commitments to purchase to exceed a threshold amount of \$25 million each, there must be specific authorization by law.

Defense Production Act

On April 17, 1984, the President signed Public Law 98-265, the Defense Production Act Amendments of 1984 which provided for an extension of the Act through September 20, 1986.

The new legislation added requirements calling for certain Presidential determinations before assistance can be afforded under some of the provisions of the Act, and it adds new limitations on furnishing assistance which replace the reporting requirements.

The Act added a new section requiring a report to the Congress on the impact of "offsets" on defense preparedness, industrial competitiveness, employment and trade of the U.S.

National Critical Materials Act of 1984

On July 31, 1984, the Arctic Research Policy Act, Public Law 98-373, was signed by the President. The "National Critical Materials Act of 1984" is included in this legislation under Title II. As passed, a Council would be established within the Executive Office of the President to serve as coor-

dinator and advisor on critical materials programs and policies. It has the authority to review, appraise, monitor, evaluate, assess, study, assist, coordinate, recommend, and advise on critical materials and materials-related policies, programs, and activities of the several Federal agencies. The Council, however, would not have line authority to direct other agencies of the Federal Government in the execution of their authorities and programs as they relate to critical materials. The law also included a sunset provision on the Council after six years, and ensured the applicability of conflict of interest rules which clarify the Council's authorities to acquire materials and supplies, to publish information, and to utilize the services of personnel of other Federal agencies on a reimbursable basis.

Guayule

On May 16, 1984, the President signed Public Law 98-284, the Critical Agricultural Materials Act. This measure extends the Native Latex Act and authorizes funding to carry out the programs therein. In addition to continuing the guayule program, it also covers other agricultural crops with potential to expand the nation's supply of various critical materials. An Office of Critical Agricultural Materials would be established under the Agriculture Department (the lead agency) to coordinate development efforts. The bill also establishes a Joint Commission on Research and Development of Critical Agricultural Materials that includes, among others, representatives of the Agriculture, Commerce, State, and Defense Departments, and the Federal Emergency Management Agency.

Barter

H.R. 6377 was introduced during the 98th Congress. The measure was designed to promote the export of agricultural commodities owned or acquired by the Commodity Credit Corporation (CCC) by facilitating the use of barter for materials produced in foreign countries, to develop markets for U.S. agricultural commodities, to protect the assets of the CCC, and for other purposes. The intent of the proposed legislation was to trade excess agricultural commodities for minerals needed in the National Defense Stockpile with resultant sav-

During consideration of H.R. 4230, legislation to extend the authorities under the Export Administration Act of 1979, an amendment was added to require the Secretary of Agriculture, not later than 90 days after the date of enactment of this Act, to submit to the Congress a report on the Status of Federal programs relating to the barter or exchange of commodities owned by the CCC for materials and products produced in foreign countries. The report was to include details of any changes necessary in existing law to allow the U.S. Department of Agriculture to implement fully any barter program. The bill was not passed prior to adjournment of the 98th Congress.

Minerals and Materials Policy

On June 26, 1984, the House Committee on Interior and Insular Affairs, Subcommittee on Mining, Forest Management and Bonneville Power Administration, held a hearing on H.R. 3717, the National Minerals and Materials Policy Coordination Act of 1983. The bill allows the Federal Government to assist private industry in documenting minerals on public lands. The bill was not reported out by the House Committee on Interior and Insular Affairs or the House Science and Technology Committee which also received the referral.

Other Actions

On April 25, 1984, H.R. 5516 was introduced in the House. It required that a three-year supply of coke be acquired for the National Defense Stockpile. The bill was referred to the Committee on Armed Services; however, no action was taken on the legislation.

Additional cosponsors were added to S. 269, a bill to provide for the disposal of silver from the National Defense Stockpile through the issuance of silver coins. A hearing was held during April 1983 on this legislation; however, the bill was not reported out of the Senate Banking, Housing and Urban Affairs Committee. No action was taken during this period on H.R. 2473. A similar bill with six cosponsors was introduced during April of 1983 and referred to the Armed Services and Banking, Finance, and Urban Affairs House Committees.

PROPERTY MANAGEMENT

Section 6 of the Strategic and Critical Materials Stock Piling Act, as revised in 1979 by Public Law 96-41, grants authority to the President to manage the National Defense Stockpile. Executive Order 12155 delegates the property management authority to the Administrator of General Services under the policy guidance of FEMA as provided in Section 3 of the Act. The Federal Property Resources Service (FPRS) of GSA is assigned the disposal, rotation, acquisition, market analysis, quality assurance, receiving, storage, maintenance, security, environmental control, and shipping activities of the stockpile program.

QUALITY ASSESSMENT

The program to assess the quality of various stockpile commodities is continuing. Two commodities were assessed during this period: (1) technically specified rubber (TSR), stored under various controlled conditions to determine the effects of storage on this type of rubber, was analyzed after the first year in storage and showed negligible changes; (2) ribbed smoked sheet (RSS) rubber stored at the Somerville, New Jersey Depot was statistically grouped and subjected to a pilot evaluation. The result of the program indicated that there is some degree of degradation in quality levels over the years; however, the material is still satisfactory for its intended use.

Stockpile Operations

Twenty new stockpile operations projects were initiated to protect the integrity of stockpile commodities during the reporting period. Approximately \$3.3 million were obligated to complete these projects which protect \$1.1 billion worth of commodities. These projects are part of a continuous effort to protect the quality of stockpile commodities and to improve the health and safety conditions of stockpile locations.

FERROALLOY UPGRADING

Following President Reagan's directive of November 1982, GSA continues to upgrade

chromite and manganese ores to high-carbon ferrochromium and high-carbon ferromanganese in order to sustain a U.S. ferroalloy furnace and processing capability vital to the national defense and security. This will also reduce the need to convert into ferroalloy in time of an emergency.

The contracts are with Macalloy Corporation of Charleston, South Carolina, and Elkem Metals Company of Pittsburgh, Pennsylvania, for the upgrading of chromite and manganese ores, respectively. The total direct cost of the two contracts for FY 1984 is estimated to be \$34 million. Payment to the contractors is made using excess stockpile materials currently authorized for disposal.

The Office of Stockpile Management has been involved during Fiscal Year 1984 in outloading and sampling approximately 122,000 short tons of chromite and 48,000 short tons of manganese ore to be shipped to the contractors; and in sampling, testing, and stockpiling the approximately 50,000 short tons of ferrochromium and 24,000 short tons of ferromanganese to be received in return. As of September 30, 1984, 124,764 short dry tons of chromite and 47,951 short dry tons of manganese ore were outloaded from Stockpile locations, and 35,496 short tons of high-carbon ferrochromium and 18,346 short tons of ferromanganese were accepted into the Stockpile.

DELIVERIES

Jamaican Bauxite

GSA inspected, sampled, and accepted 1,000,000 tons of metallurgical bauxite for the Commodity Credit Corporation (CCC) of the Department of Agriculture under its barter agreement with Jamaica. The receipt of this material completes the stockpiling of bauxite from Jamaica under the Presidential directive of 1982-83.

Beryllium

Out of 24 on order, 19 billets of hot-pressed powder block have passed all required tests and were accepted by the Government. The contract with Brush-Wellman in Elmore, Ohio, for 60,000 pounds of beryllium has a value of \$14.3 million.

Cobalt

Approximately 71 cobalt lots totaling 4,673,632 pounds, worth \$69 million, were accepted. SOZACOM, the state marketing company of Zaire, provided 61 lots and Memaco of Zambia provided 10.

Jewel Bearings

The Government-owned William Langer Jewel Bearing Plant located at Rolla, North Dakota, produces jewel bearings for sale to the Stockpile and to the defense contractors. Approximately 490,000 jewel bearings were delivered to the NDS during the period.

Quinidine

Approximately 199,198 ounces of quinidine sulfate, a powdered medicinal for regulating heart rhythm, was supplied under contract by Henley and Company. The material, produced in France, has a value of \$667,604. An additional 134,355 ounces has also been sampled and weighed, and samples were forwarded for laboratory analyses as part of a contract for 398,596 ounces valued at \$1,590,362 with R.W. Greef & Company.

Tantalum

Approximately 51,362 pounds of contained tantalum, out of 122,100 pounds, have been sampled, weighed, and analyzed. The contract with Greenbushes is valued at \$3,670,680. In addition, there are 183,150 pounds on order from three other suppliers.

Titanium

Contracts for 9,000,000 pounds of titanium sponge are currently in effect with three suppliers. Approximately 5,554,000 pounds offered by Philipp Brothers, one of the suppliers, have been accepted. An additional 273,600 pounds offered by Timet were also accepted.

Vanadium Pentoxide

Approximately 250,000 pounds of 362,000 pounds offered under contract with the Associated Metals and Minerals Corporation has been accepted. The contract is valued at \$839,840.

STATUS OF THE NATIONAL DEFENSE STOCKPILE INVENTORY

The composition of the stockpile inventory is compared with the goals in Figure 6. Major restructuring of the stockpile inventory is necessary because many of the materials now in the inventory were acquired during the 1950's. To fill the goals at September 30, 1984, prices would require acquisition of additional materials valued at approximately \$9.9 billion. The inventory of the stockpile contains \$6.1 billion goals value of \$17.0 billion. The total current stockpile is valued at \$10.4 billion, including an excess inventory not held for goals valued at \$3.3 billion.

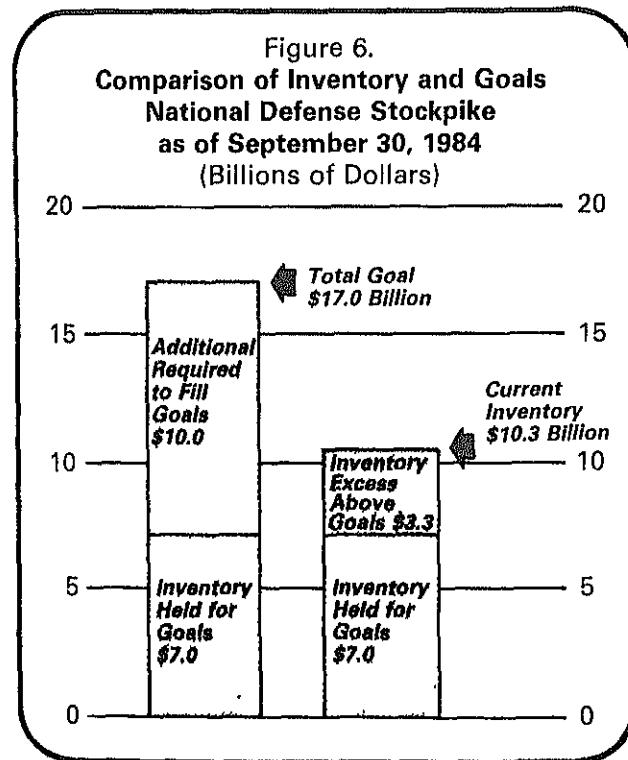
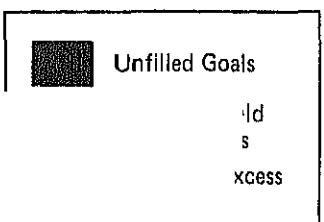
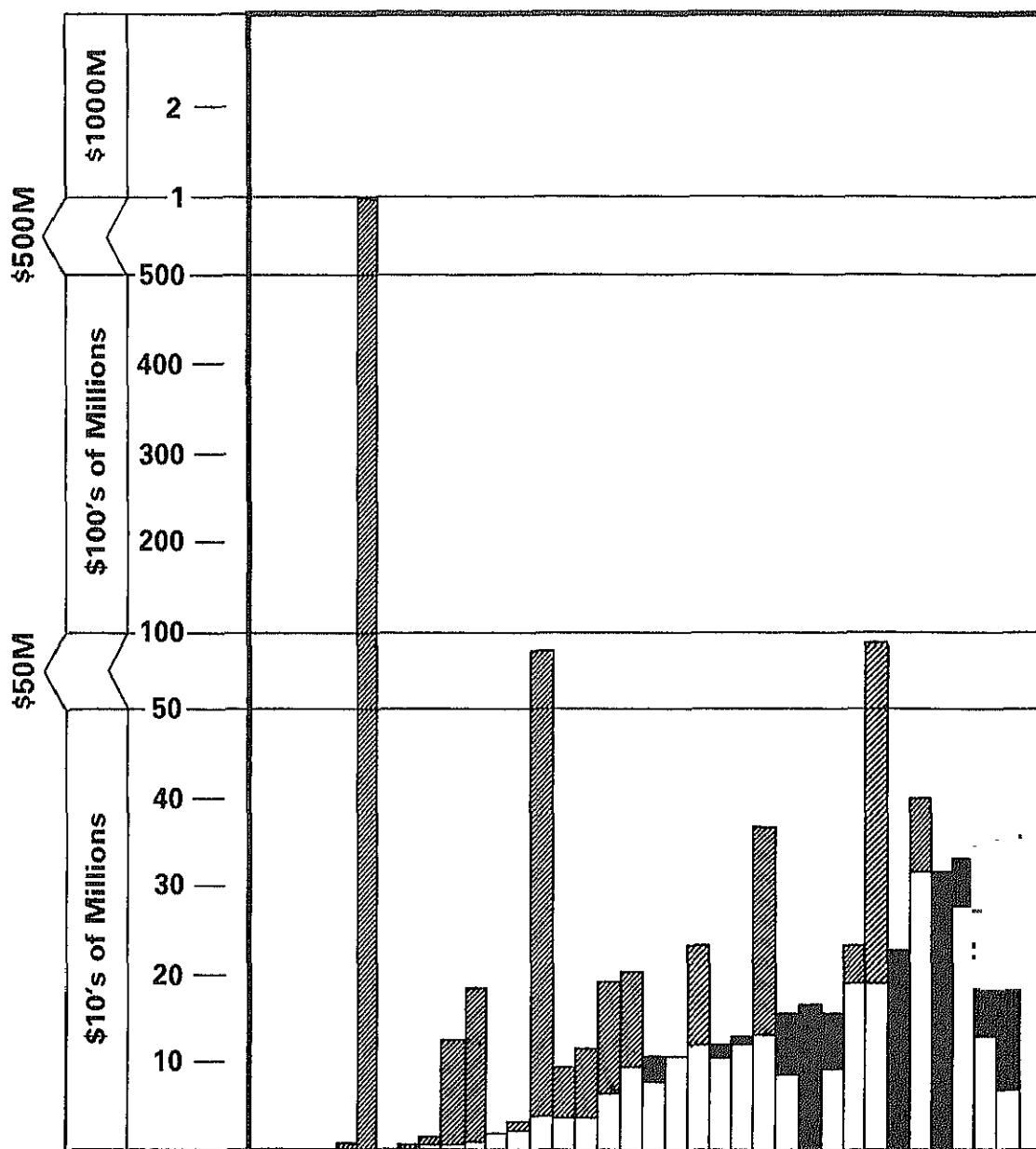


Figure 7 is a breakout, by family group, of those values listed in Figure 6. It provides a more detailed picture of the status of the National Defense Stockpile inventory. This figure shows goal values, in ascending order, of each group. Applied against these values are the shortfalls or excesses, as appropriate. The numbers next to each material name correspond to those numbers used in Table 2 (See Appendix 1).

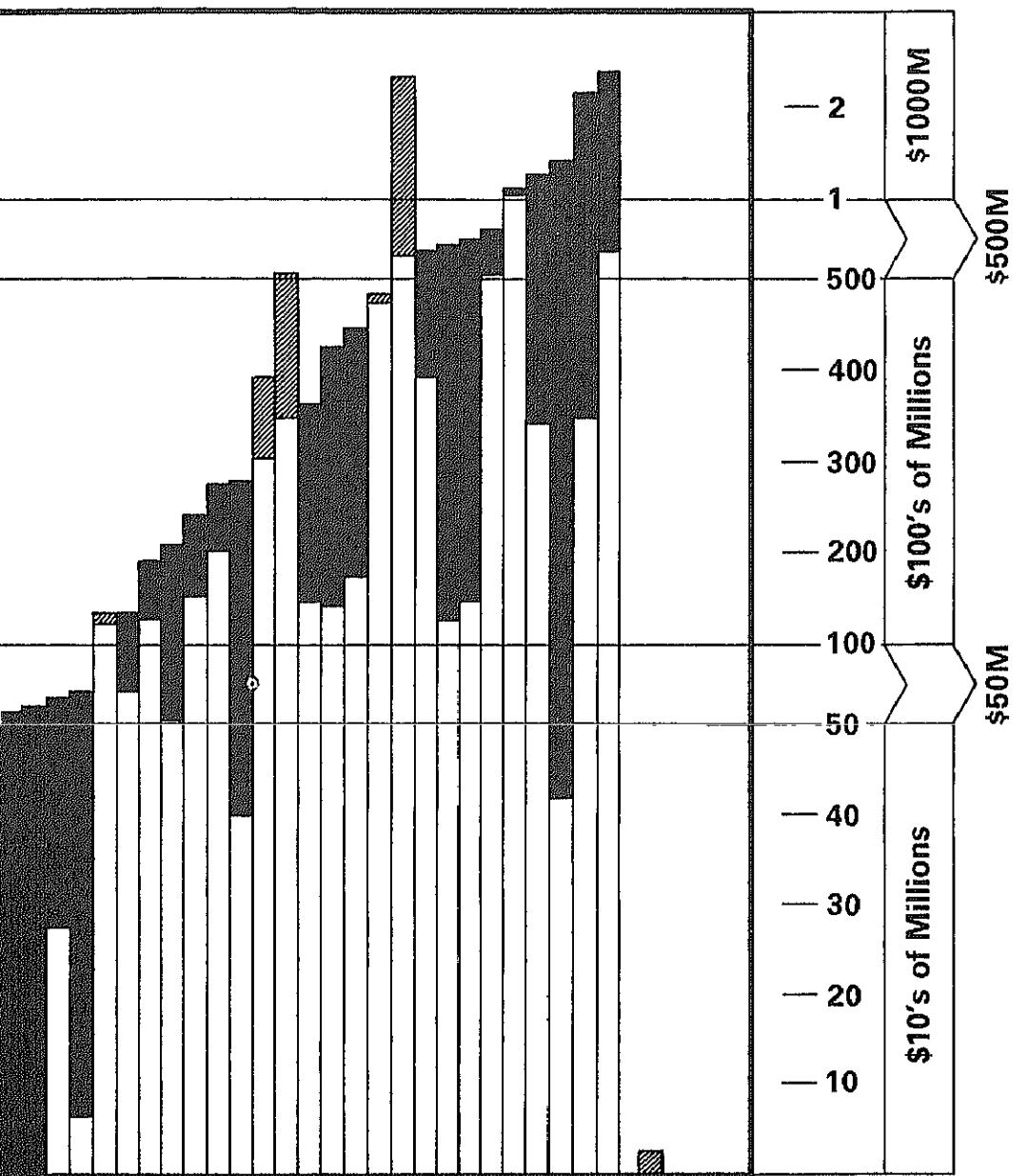
Offsets have been applied to provide a more accurate picture of progress toward goals. The term “offset” means the allocation of an equivalent amount of one form of a material as a credit toward the goal for another form. (See Appendix 2, Procedure, for an example of how offsets are computed.)

Figure
Status of the National Defense Stock
(Arranged by Ascen
as of Septem



Material	Unfilled Goals	Excess	Current Stock
Sapphire and Ruby	49	1	1
Silver, Fine	51	0	0
Molybdenum Group	35	0	0
Talc, Steatite-Bl. & Lump	52	0	0
Mica, PB	33	0	0
Mica, MF, 1st & 2nd Qual.	31	0	0
Thorium Nitrate	54	0	0
Graphite, Nat.-other	23	0	0
Mica, PS	34	0	0
Mercury	29	80	10
Vegetable Tannin-Ch.	59	0	0
Quartz Crystals	43	0	0
Asbestos, Chrysotile	5	0	0
Manganese Dioxide-Bat.Gr.	27	0	0
Quinine	45	0	0
Vegetable Tannin-Wa.	61	0	0
Asbestos, Amosite	4	0	0
Graphite, Natural Ceylon-Al.	21	0	0
Bismuth	8	0	0
Silicon Carbide-Cr.	50	0	0
Cadmium	9	0	0
Natural Insulation Fibers	37	0	0
Ricinoleic/Sebacic Acid Prod.	46	0	0
Mica, MS	32	0	0
Vegetable Tannin-Qu.	60	0	0
Cordage Fibers, Sisal	16	0	0
Iodine	24	0	0
Germanium	20	0	0
Mica, MB-Stained & Better	30	0	0
Rutile	48	0	0
Quinidine	49	0	0
Columbium Group	13	0	0

Inventory Material Family Groups
(~~Excluding Goal Value~~)
30, 1984

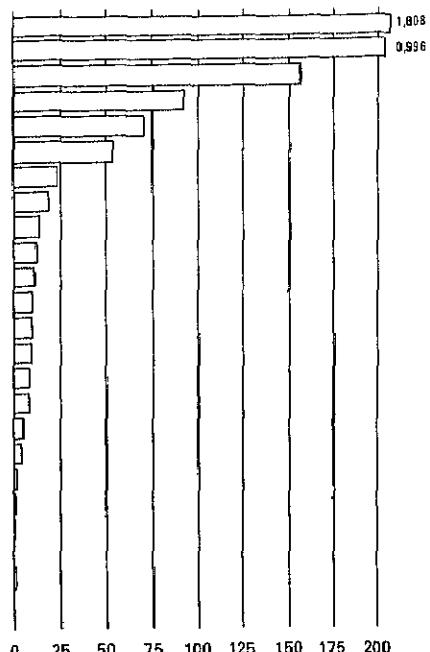


NOTE:
SCALING USED ON
THIS GRAPH

Figure 8
Excesses in Inventory
of Stockpile Materials
as of September 30, 1984
(\$ Millions)

55 Tin
51 Silver
57 Tungsten
17 Diamonds
60 Vegetable Tannin Qu
29 Mercury
50 Silicon Carbide
54 Thorium Nitrate
5 Asbestos, Chrysotile
31 Mica M.F., 1st & 2nd Qual
4 Asbestos, Amosite
27 Manganese Diox -B G
28 Manganese, Ch & Met
3 Antimony
24 Iodine
43 Quartz
59 Vegetable Tannin-Ch
32 Mica-M S
34 Mica-P S
52 Talc, Steatite Bl & Lp
49 Sapphire & Ruby

Other excess material
(Inv. material not on strategic
& critical materials list)

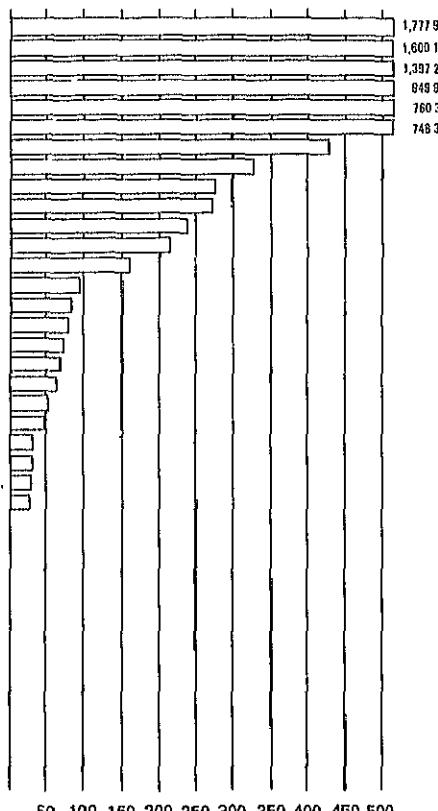


BREAKOUT OF STOCKPILE INVENTORY EXCESSSES AFTER APPLYING OFFSETS.

TOTAL EXCESS: \$3.3 BILLION

Figure 9
Shortfalls in Inventory
of Stockpile Materials
as of September 30, 1984
(\$ Millions)

56 Titanium Sponge
1 Aluminum Metal Gr
14 Copper
62 Zinc
47 Rubber
38 Nickel
12 Cobalt
26 Lead
41 Platinum-Pla.
40 Platinum-Pal
6 Bauxite, Refractory
53 Tantalum
19 Fluorspar, Met Gr
58 Vanadium
18 Fluorspar, Acid Gr
15 Cordage Fibers-Ab
7 Beryllium Metals
42 Pyrethrum
2 Aluminum Ox , Ab Gr.
25 Jewel Bearings
11 Chromite, Ref Gr. Ore
39 Platinum-Ir
20 Germanium
36 Morphine Sulph & Ret Anal.
44 Quinidine
16 Cordage Fibers-Si
48 Rutile
13 Columbium Gr.
37 Nat Insulation Fibers
9 Cadmium
46 Ricinoleic/Sob. Acid. Prod
22 Graphite, Nat'l. Met. Cryst.
30 Mica-M.B. St & Better
10 Chromium, Ch. & Met
45 Quinine
21 Graphite, Nat'l. Cey. Al
8 Bismuth
33 Mica-P.B.



BREAKOUT OF STOCKPILE INVENTORY SHORTFALLS AFTER APPLYING OFFSETS.

TOTAL SHORTFALL: \$9.9 BILLION

PURCHASE GUIDELINES

Purchase specifications are developed by the Interagency Committee for Stockpile Purchase Specifications. This Committee is chaired by the Department of Commerce with members representing the Departments of Defense, the Interior, Agriculture, State, GSA, and FEMA. The draft specifications are approved by FEMA and published by the Department of Commerce.

During this report period the Interagency Committee for Stockpile Purchase Specifications reviewed proposed specifications for aluminum oxide, refractory grade bauxite, chromium metal, platinum, germanium, and vanadium pentoxide, and published new specifications for guayule rubber and aluminum.

Figure 10
NATIONAL DEFENSE STOCKPILE PURCHASE SPECIFICATIONS

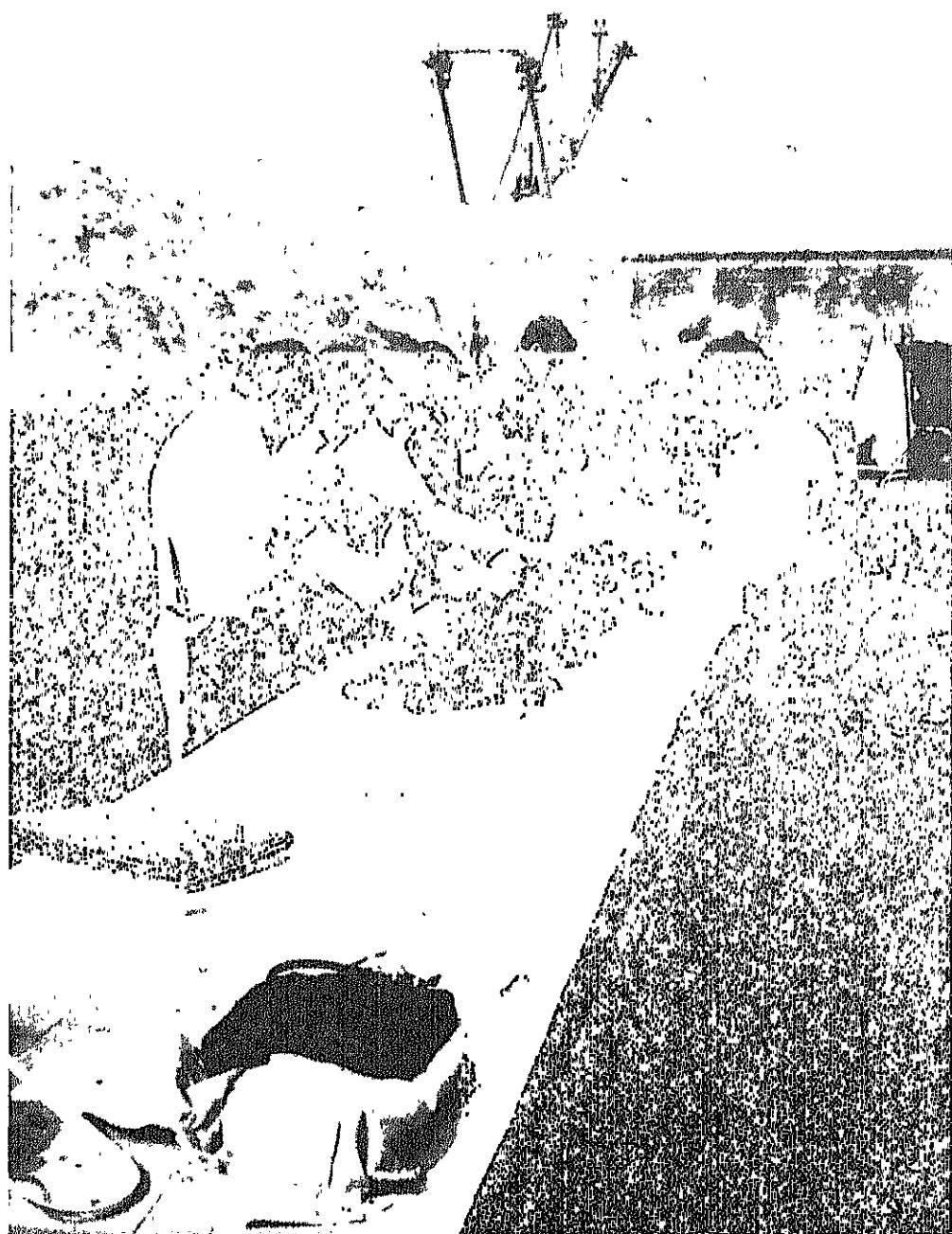
Number	Material	Date Issued
P 62 R3	Aluminum	August 31, 1984
P-90 R3	Aluminum Oxide Abrasive, Fused, Crude	November 13, 1980
P 2a R4	Antimony Metal	June 10, 1980
P 2b R2	Antimony Sulphide Ore and Concentrates—Chemical Grade	June 10, 1980
P-3-R6	Asbestos—Chrysotile	February 26, 1982
P-90a	Bauxite—Abrasive Grade	June 22, 1981
P 5b R1	Bauxite, Metal Grade, Jamaica Type	February 9, 1983
P 5c R5	Bauxite, Refractory Grade	June 22, 1982
P 6-R5	Beryl Concentrates	November 13, 1980
P 94 R3	Beryllium—Copper Master Alloy	November 13, 1980
P-110a R1	Beryllium Metal, Hot Pressed Powder Billets	May 9, 1984
P 110 R2	Beryllium Metal, Vacuum Cast Ingot	June 25, 1981
P 7 R4	Bismuth	June 10, 1980
P 8 R2	Cadmium	March 7, 1979
P 9 R3	Castor Oil	June 22, 1982
P 86 R2	Chestnut Tannin Extract	February 1, 1980
P 65 R4	Chromite—Chemical Use	February 1, 1980
P 96 R3	Chromium Metal	May 23, 1984
P-11a R6	Ferrochromium—Low Carbon	June 9, 1976
P-11b R4	Ferrochromium—High Carbon	July 25, 1983
P 13 R5	Cobalt	June 28, 1983
P 113 R2	Columbium Source Materials	January 27, 1984
P 16a R3	Copper	March 16, 1984
P-17b R6	Cordage Fibers—Sisal	October 19, 1977
P-18 R2	Corundum—Massive Micro Crystalline Ore	January 23, 1977
P 69a R2	Fluorspar—Acid Grade	January 2, 1976
P 69b R3	Fluorspar—Metallurgical Grade	May 10, 1984
P 40 R	Iridium	June 25, 1981
P-25 R2	Jewel Bearings	March 27, 1981
P 28 R3	Lead	March 16, 1984
P 98 R3	Manganese Metal—Electrolytic	June 9, 1976
P 30a R4	Ferromanganese (Standard High Carbon)	July 25, 1983
P-37a R	Morphine Sulphate	March 7, 1979
P 36 R4	Nickel—High Purity	January 26, 1983
P 37 R3	Opium	March 7, 1979
P 99 R6	Palladium	June 25, 1981
P 41 R5	Platinum	June 25, 1981
P 42 R2	Pyrethrum Extract	February 1, 1980
P 44 R3	Quebracho Tannin Extract	February 1, 1980
P 45 R4	Quinidine Sulfate	January 26, 1983
P 46 R3	Quinine Sulfate	November 13, 1980
P 48a R5	Rubber—Crude Natural	October 19, 1977
P 48b R	Rubber—Technically Specified Rubber (Hevea)	June 2, 1982
P 48c R	Rubber—Parthenium (Guayule)	August 27, 1984
P 49 R6	Rutile	November 3, 1981
P 25a	Sapphire and Ruby Components, Synthetic	March 27, 1981
P 95 R2	Silicon Carbide—Crude	January 12, 1981
P 112-R2	Silver	June 10, 1980
P 53 R2	Talc (Steatite) Block	June 10, 1980
P 53a R2	Talc (Steatite) Lump	June 10, 1980
P 106 R3	Tantalum Carbide Powder	February 1, 1980
P 113a	Tantalum Source Materials	August 3, 1981
P 55 R3	Tin	June 10, 1980
P 97-R7	Titanium Metal Sponge	June 2, 1982
P-58 R2	Vanadium Pentoxide	June 25, 1981
P 100 R1	Ferrovanadium	October 19, 1977
P 87-R2	Wattle Tannin Extract	February 1, 1980
P 59 R1	Zinc	March 16, 1984

RESEARCH AND DEVELOPMENT

U.S. Geological Survey (USGS) and Bureau of Mines scientists (Department of the Interior), represent the United States in the International Strategic Minerals Inventory (ISMI), formed in 1982. Counterpart agencies are located in Canada, the Federal Republic of Germany, the Republic of South Africa, and Australia. These countries are assisting in a global inventory for selected strategic mineral resources. Thus far, summary reports have been completed for manganese (USGS Circular 930-A), chromium (USGS Circular 930-B), and phosphate (USGS Circular 930-C), and a draft report on nickel is currently being reviewed. Similar

reports on cobalt, graphite, platinum-group elements, tantalum, titanium, vanadium, and tungsten are being prepared in draft form at this time. According to ISMI reports, current chromite sources are limited chiefly to South Africa and Zimbabwe, but potential exploitable resources exist in Greenland, Papua (New Guinea), and other parts of South Africa.

A meeting of the International Geological Congress in the U.S.S.R. in August of 1984 afforded four Bureau of Mines scientists the opportunity to view a number of Soviet mineral deposits, and a stop in Finland provided updated information on chromite deposits in that country.



Geologists, including staff members of the U.S. Bureau of Mines, examining specimens of manganese ore at the Nikopol Manganese Mine, Ukraine, U.S.S.R.

The Bureau of Mines and the Organization of American States sponsored a joint meeting of 8 Latin American countries and representatives of the United States. The meeting was organized to improve mineral production statistics on 12 strategic materials, and took place in Argentina in September of this year.

The Bureau of Mines published reviews of the mineral industries of China and the U.S.S.R. Included in these reviews are production and trade data for individual mineral commodities through 1983, as well as summaries of important mineral developments. These reviews also appeared in the "Mining Annual Review 1984," published by the Mining Journal, Ltd., of London, England.

Mineral Land Investigations

The Bureau of Mines continues to study the availability of Federal lands compared with locations of known significant mineral deposits and related terranes, or mineralogically favorable areas. The Bureau published its study on Washington during the report period, and studies of Colorado, Oregon, Arizona, New Mexico, and Alaska are in process. Additionally, a draft report entitled "Strategic and Mineral Assessment of the Stillwater Complex, Southwest Montana," was completed. This complex contains approximately 80 percent of the U.S. resources of chromite, and 75 percent of its platinum-group metals, and has been used in periods of national emergency.

The Bureau of Mines and the USGS continued to study lands managed by the Bureau of Land Management (BLM), Department of the Interior, to determine suitability for wilderness. As much as 13.5 million acres in ten western States may require reconnaissance, as mandated by the Federal Land Planning and Management Act of 1976. The Bureau has scheduled about 2.5 million acres of this land for study each year.

Mineral occurrence of selected strategic and critical materials continue to be investigated by the Bureau of Mines. During the Fiscal Year 1984 field seasons, its engineers obtained bulk samples for chemical analysis and metallurgical testing. Samples included tin, columbium, tungsten, zinc, lead, silver,

platinum-group metals, rare earths, and chromium. A draft report on locations of chromite, cobalt, and platinum-group metals occurrences in Alaska was completed and included a summary of the economics of developing nine of the larger deposits.

In cooperation with eleven state geological agencies, the USGS has begun long-range multidisciplinary studies of the midcontinent region of the United States. The first phase of this program is to provide a compilation of existing mineral resource data, which will provide a basis for planning future cooperative topical and areal research. Studies of the eastern Mesozoic basins are also being conducted by the USGS. These basins may have significant potential for deposits of the Noril'sk type—the Soviet Union's most important source of nickel, cobalt, and platinum—and also are potential hosts for uranium.

Ocean Mineral Exploration

In February of 1984, a joint Federal-State task force was formed with the MMS and the state of Hawaii to consider the economic potential and environmental impacts of ocean mining for the recovery of cobalt-rich manganese crusts in the Exclusive Economic Zone (EEZ). Another task force was formed with the states of Oregon and California to consider the economic, engineering and environmental aspects of possible ocean mining of polymetallic sulfide resources from the Gorda Ridge.

The Bureau of Mines, MMS, and the USGS entered into a cooperative research planning effort to identify research needs in providing economic and environmentally sound development in the EEZ. An initial investigation is being conducted, with the cooperative efforts of the state of Hawaii, to determine the physical properties of cobalt-rich manganese crusts in the EEZ.

Strategic Minerals Research

It is estimated that approximately 40,000 tons per year of mixed heat- and corrosion-resistant superalloy scrap is currently being unnecessarily downgraded, discarded, or exported because operators are having difficulty identifying and

separating out the more complex alloys while employing standard "spark testing" methods. In an effort to remedy this, the Bureau of Mines has developed a spectrophotometer technique that makes an analysis of the shape and color of spark patterns, and then, through a small computer, identifies the alloy being tested. (See photo.)



Scientists inspect rock dredge which has just recovered samples of EEZ cobalt-enriched manganese crusts. (Photo courtesy of William R. Normark, USGS)

However, some mixed superalloy scrap cannot be segregated by this type of sorting. This mixed alloy scrap is designed to resist corrosion and high temperature, and is inherently resistant to dissolution in acid solutions. To overcome this, the Bureau of Mines has developed a method to treat this scrap with molten zinc to form a friable material which can then be crushed and put into an acid solution. (The zinc is distilled away and can be recovered for use.) By this method, metals including chromium, cobalt, and nickel can be recovered. (See photo.)



Bureau of Mines spark testing apparatus to separate complex alloy scrap. In this instance scrap Incond 625, an alloy of nickel and chromium, has been identified

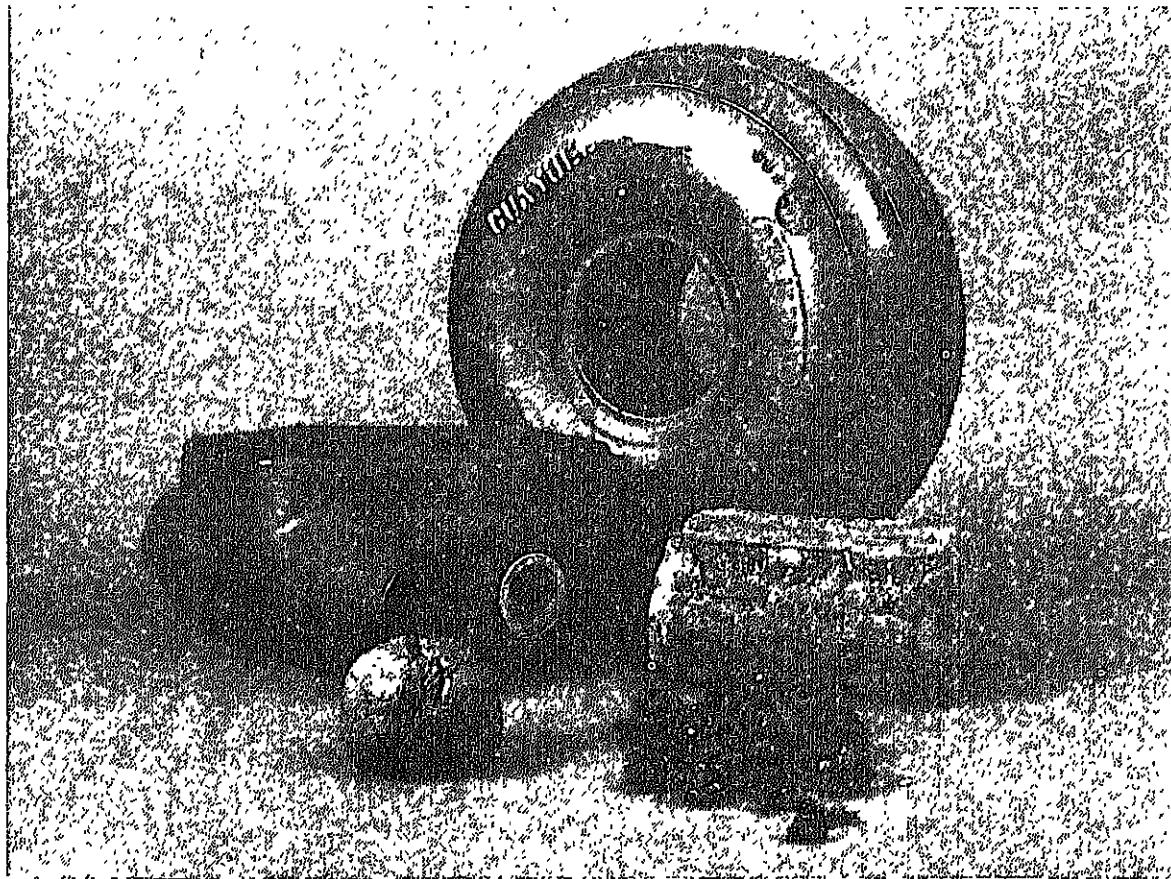
Substitution

Several methods are being employed by the Bureau of Mines in finding substitutes for chromium in stainless and low-alloy, heat-treatable steels. Research in the area of stainless steel is centered around the use of silicon, aluminum, and molybdenum as partial or complete substitutes for chromium. In the area of low-alloy steel, research is centered around completely replacing chromium with molybdenum and manganese. Gears made from the chromium-free steel are scheduled to be tested for long-term durability.

In other areas of mineral research, the Bureau of Mines continues to review mine backfill technologies to provide the most efficient recovery of strategic and critical materials from underground deposits. The Bureau is also studying current technologies in an effort to identify what is needed for rapid development of potential domestic deposits of materials, should there be a disruption to foreign supply.

In addition to the efforts by the Bureau of Mines at the Department of the Interior, other departments and agencies also explore potential substitutes for strategic and critical materials. In one such effort, the U.S. Department of Agriculture (USDA) and the Department of Commerce recently oversaw the production of a three-pound block of rubber from guayule. The production resulted from research efforts supported by the two Departments. The rubber was produced by a pilot-scale research facility at the Texas Engineering Experi-

ment Station at Texas A and M University, Texas, as a part of a contract with the Army Automotive Tank Command, Warren, Michigan. The contract was for production of this rubber for testing on M-1 tank pads. The USDA has provided a \$100,000 grant to further refine processing and application technology. The Texas A and M Food Protein Research and Development Center is proceeding with this project, and has developed an oilseed (cottonseed) extraction method, rather than the previously used water extraction method.



Natural rubber from guayule and end products for defense.

Substitution and Conservation of Critical and Strategic Materials

The Defense Department (DoD) strongly supports the policy that advanced technology must be developed for substitution and conservation to alleviate growing U.S. dependence on foreign sources. To this end, considerable research and development has been done in the area of Metal

Matrix Composites (MMC). MMC constitute an important approach to both substitution and conservation that would decrease DoD dependence on foreign materials. In addition to imported materials, use of MMC has been considered for all materials critical to future weapon systems that could be in short supply.

The Navy has been assessing the potential for utilizing MMC as substitutes for critical and strategic materials in future Navy systems. The materials considered in this assessment include both continuous and discontinuous reinforcement in a metal or intermetallic matrix; the reinforcement may be ceramic or metallic. After analyzing the available information on potential shortages of strategic and critical materials in terms of future Navy needs, possible problem areas include: tantalum, columbium, cobalt, chromium, manganese, beryllium, titanium, platinum-group metals, aluminum ores, and gold.

Many material applications have been surveyed to determine MMC suitability. Initial efforts were oriented toward ongoing Navy programs and it was concluded that substitute technology is being developed for steel with a high chromium and cobalt content; hydrospace structures—a substitute for titanium; hypersonic motor cases—a substitute for either titanium or steel containing chromium, cobalt, or manganese; shipboard antennas—a substitute for steel with a high chromium, cobalt, or manganese content.

MMC could be substituted for almost all of the structural critical and strategic materials used at temperatures up to and possibly above 2,000°F. MMC selection would be based on requirements of the individual systems; as a first cut, however, MMC can be classified by temperature range. Aluminum and magnesium composites should be satisfactory up to at least 800°F. Graphite-reinforced aluminum has shown some structural stability near or at the melting point of the matrix. At higher temperatures, up to about 1,300°F, silicon carbide-reinforced titanium has exhibited excellent properties. Fabrication of graphite-reinforced copper has been shown feasible and on the basis of early testing, it may be useful up to about 2,000°F. Above that temperature composites such as tungsten-wire-reinforced superalloys appear promising.

In terms of specific critical and strategic materials, MMC appear to have strong substitute possibilities for beryllium, titanium, steels with high chromium,

cobalt and/or manganese content, selected superalloys, and some refractory metals. For composites being developed in current DoD programs, data are becoming available for evaluating substitutes:

Silicon-Carbide-Reinforced Aluminum (SiC/AL). A very high percentage of the total MMC development funding has been in SiC/AL. Possible applications for the Navy include shipboard antennas and tactical missile components (replacing steel containing large amounts of cobalt, chromium and/or manganese), guidance system stable members (replacing beryllium), and in torpedo structures. Materials specifications are required to proceed with these applications.

Graphite-Fiber-Reinforced Metals. Graphite-reinforced composites are in an evolutionary state because the fiber properties are continually being improved. Potential uses for these composites that have substitution implications include tactical missiles (replacing steel containing large amounts of cobalt, chromium and/or manganese), missiles (replacing titanium), and satellite structures (replacing beryllium).

Magnesium Composites. Since bauxite is imported, magnesium is really the only truly domestic light metal. The fabrication feasibility of a large number of magnesium composites has been shown, including graphite, boron, and silicon carbide.

The possibilities of recycling both continuous and discontinuous MMC have been examined. The most feasible method for continuous material is to melt the matrix away from the fibers. Another possibility is to soften the composite by soaking it in a liquid (maceration) and reforming it as a discontinuous MMC. Properties of such materials would have to be evaluated. However, reformed composites might prove useful in such applications as joints in space structures where low thermal expansion is a major criterion. For discontinuous reinforcements, macerating and reforming appear to be feasible recycling methods.

APPENDIX 1

NATIONAL DEFENSE STOCKPILE INVENTORY

The data on the National Defense Stockpile inventory given in Table 2 excludes quantities that were sold but not shipped from depots to the purchasers. In the Statistical Supplement (available from the General Services Administration), the inventory is listed as "Total Inventory in Storage" with a separate line for "Unshipped Sales."

The inventory quantities given in Table 2 combine stockpile and nonstockpile grade materials. Separate quantities for each of these grades can be found in the Statistical Supplement. Nonstockpile grade material may vary only slightly from the stockpile grade and in some cases is temporarily credited toward goals.

For some materials where a goal deficit occurs, the excess of another form of the material is held to offset the shortage as indicated in the footnotes at the end of Table 2. The term "offset" means the allocation of an equivalent amount of one form of a material as a credit toward the goal for another form.

Materials are grouped by "families," and a summary line for each basic family group is included. The materials have been grouped in each family according to their status as raw materials, semifinished products, or finished products that contain the same common ingredient. The values are shown in the summary line for each family group and are expressed in the basic unit common to all members of the group. In all but three cases, the basic unit is the metal equivalent for each type. There is a different conversion factor for each type, because each requires different technology and incurs different losses for conversion. The factors used for calculating these equivalent amounts and the calculation procedure are provided in Appendix 2.

Market values are current prices at which comparable materials are being traded. In the absence of current trading, the values are estimates. These are not necessarily the amount that would be realized if the material were sold. A key to abbreviations used in Table 2 and elsewhere in this report is provided in Table 1.

Abbreviations

AMA LB	- Anhydrous Morphine Alkaloid (Pounds)
Av Oz	- Avoirdupois Ounce
FL	- Flask (76-Pound)
KT	- Carat
LB	- Pound
LB Cb	- Pounds of Contained Columbium
LB Co	- Pounds of Contained Cobalt
LB Mo	- Pounds of Contained Molybdenum
LB Ta	- Pounds of Contained Tantalum
LB W	- Pounds of Contained Tungsten
LCT	- Long Calcined Ton

LDT	- Long Dry Ton
LT	- Long Ton
MT	- Metric Ton
PC	- Piece
SDT	- Short Dry Ton
ST	- Short Ton
ST Ni+Co	- Short Tons of Contained Nickel Plus Cobalt
ST V	- Short Tons of Contained Vanadium
Tr Oz	- Troy Ounces

Table 2

NATIONAL DEFENSE STOCKPILE INVENTORY OF STRATEGIC AND CRITICAL MATERIALS
September 30, 1964

Material	Unit	Goal	Inventory	Value of Inventory (Millions \$)	Quantity After Crediting Offset
1. Aluminum Metal Group	ST Al Metal	7,150,000	4,043,784	\$ 782.7	3,102,858
Alumina	ST	700,000	0	3.4	-
Aluminum	ST	21,000,000	11,454,413	515.4	697,920
Bauxite, Metal Grade, Jamaica Type	LDT	6,100,000	5,299,597	263.9	9,545,587
Bauxite, Metal Grade, Surinam Type	LDT				800,403
2. Aluminum Oxide, Abrasive Grain Group	ST Ab Grain	638,000	259,124	128.6	378,876
Aluminum Oxide, Abrasive Grain	ST	0	50,904	63.6	b
Aluminum Oxide, Fused, Crude	ST	0	249,867	65.0	b
Bauxite, Abrasive Grade	LCT	1,000,000	0	-	b
3. Antimony	ST	36,000	38,841	133.2	2,841
4. Asbestos, Amosite	ST	17,000	34,011	23.8	17,001
5. Asbestos, Chrysotile	ST	3,000	10,751	19.6	7,751
6. Bauxite, Refractory	LCT	1,400,000	199,926	40.4	1,200,074
7. Beryllium Metal Group	ST Be Metal	1,220	1,061	202.5	159
Beryl Ore (11% BeO)	ST	18,000	17,987	21.8	13
Beryllium Copper Master Alloy	ST	7,900	7,387	91.8	513
Beryllium Metal	ST	400	229	88.9	171
8. Bismuth	LB	2,200,000	2,081,288	11.9	118,702
9. Cadmium	LB	11,700,000	6,328,809	8.5	5,371,191
10. Chromium, Chemical and Metallurgical Group	ST Cr Metal	1,353,000	1,289,976	1,047.1	28,077
Chromite, Chemical Grade Ore	SDT	675,000	242,414	13.6	c
Chromite, Metallurgical Grade Ore	SDT	3,200,000	2,365,851	235.1	c
Chromium, Ferro, High Carbon	ST	185,000	402,696	300.1	c
Chromium, Ferro, Low Carbon	ST	75,000	318,892	418.0	c
Chromium, Ferro, Silicon	ST	90,000	56,357	52.1	c
Chromium, Metal	ST	20,000	3,763	28.2	c
11. Chromite, Refractory Grade Ore	SDT	850,000	391,414	42.6	458,586

Table 2 (continued)

Material	Unit	Goal	Inventory	Value of Inventory (Millions \$)	Quantity After Crediting Offset
				Excess	Deficit
12. Cobalt	LB Co	85,400,000	46,193,915	\$ 508.1	39,206,085
13. Columbium Group	LB Cb Metal	4,850,000	2,532,419	18.5	2,317,581
Columbium Carbide Powder	LB Cb	100,000	21,372	.6	78,628
Columbium Concentrates	LB Cb	5,600,000	1,806,218	11.0	d
Columbium, Ferro	LB Cb	0	930,911	5.3	
Columbium, Metal	LB Cb	0	44,851	1.6	
14. Copper	ST	1,000,000	29,048	41.8	970,952
15. Cordage Fibers, Abaca	LB	155,000,000	0	-	155,000,000
16. Cordage Fibers, Sisal	LB	60,000,000	0	-	60,000,000
17. Diamond, Industrial Group	KT	29,700,000	36,060,908	404.3	6,360,908
Diamond Dies, Small	PC	60,000	25,473	1.1	34,527
Diamond, Industrial, Crushing Bort	KT	22,000,000	22,001,252	38.5	1,352
Diamond, Industrial, Stones	KT	7,700,000	14,046,820	356.5	6,346,820
18. Fluorspar, Acid Grade	SDT	1,400,000	895,983	155.0	504,017
19. Flourspar, Metallurgical Grade	SDT	1,700,000	411,738	51.5	1,288,262
20. Germanium	KG	30,000	0	-	30,000
21. Graphite, Natural, Ceylon, Amorphous Lump	ST	6,300	5,500	10.7	800
22. Graphite, Natural, Malagasy, Crystalline	ST	20,000	17,840	53.5	2,160
23. Graphite, Natural, Other Than Ceylon & Malagasy	ST	2,800	2,804	2.0	4
24. Iodine	LB	5,800,000	7,372,112	40.0	1,572,112
25. Jewel Bearings	PC	120,000,000	73,019,008	82.1	46,980,992
26. Lead	ST	1,100,000	601,025	396.7	498,975
27. Manganese, Dioxide, Battery Grade Group	SDT	87,000	212,165	20.1	125,165
Manganese, Battery Grade, Natural Ore	SDT	62,000	209,154	15.9	e
Manganese, Battery Grade, Synthetic Dioxide	SDT	25,000	3,011	4.2	

Table 2 (continued)

Material	Unit	Goal	Inventory	Value of Inventory (Millions \$)	Excess	Quantity After Crediting Offset Deficit
28. Manganese, Chemical & Metallurgical Group	ST Mn Metal	1,500,000	1,927,287	\$ 486.3		377,928
Manganese Ore, Chemical Grade	SDT	170,000	171,806	14.1		1,806
Manganese Ore, Metallurgical Grade	SDT	2,700,000	3,310,752	157.5		f
Manganese, Ferro, High Carbon	ST	4,39,000	599,978	262.5		f
Manganese, Ferro, Low Carbon	ST	0	0	-		-
Manganese, Ferro, Medium Carbon	ST	0	28,920	19.6		f
Manganese, Ferro, Silicon	ST	0	23,574	11.1		f
Manganese Metal, Electrolytic	ST	0	14,172	21.5		f
29. Mercury	FL	10,500	174,423	56.4		163,923
30. Mica Muscovite Block, Stained & Better	LB	6,200,000	5,212,361	27.8		987,639
31. Mica Muscovite Film, 1st & 2nd Qualities	LB	90,000	1,179,533	13.8		1,089,533
32. Mica Muscovite Splittings	LB	12,630,000	15,653,051	23.5		3,023,051
33. Mica Phlogopite Block	LB	210,000	130,745	.7		79,255
34. Mica Phlogopite Splittings	LB	930,000	1,569,001	3.1		639,001
35. Molybdenum Group	LB Mo	0	0	-		-
Molybdenum Disulphide	LB Mo	0	0	-		-
Molybdenum, Ferro	LB Mo	0	0	-		-
36. Morphine Sulphate and Related Analgesics	AMA LB	130,000	71,303	26.6		58,697
Crude	AMA LB	0	31,795	5.3		-
Refined	AMA LB	130,000	39,508	21.3		g
37. Natural Insulation Fibers	LB	1,500,000	0	-		1,500,000
38. Nickel	ST Ni+Co	200,000	32,209	143.7		167,791
39. Platinum Group Metals, Iridium	Tr Oz	98,000	27,789	12.9		70,211
40. Platinum Group Metals, Palladium	Tr Oz	3,000,000	1,254,987	174.4		1,745,013
41. Platinum Group Metals, Platinum	Tr Oz	1,310,000	452,636	146.7		857,364
42. Pyrethrum	LB	500,000	0	-		500,000
43. Quartz Crystals	LB	600,000	1,948,433	11.7		1,348,433
44. Quinidine	Av Oz	10,100,000	1,874,504	6.5		8,225,496

Table 2 (continued)

Material	Unit	Cost	Inventory	Value of Inventory (Millions \$)	Quantity After Crediting Offset
				Excess	Deficit
45. Quinine	Av Oz	4,500,000	3,246,164	\$ 7.6	1,253,836
46. Ricinoleic/Sebacic Acid Products	LB	22,000,000	12,524,242	9.2	h
47. Rubber	MT	864,000	120,882	123.7	743,118
48. Rutile	SDT	106,000	39,186	12.7	66,814
49. Sapphire and Ruby	KT	0	16,305,502	.2	16,305,502
50. Silicon Carbide, Crude	ST	29,000	80,550	36.2	51,550
51. Silver, Fine	Tr Oz	0	136,505,946	996.1	136,505,946
52. Talc, Steatite Block & Lump	ST	28	1,081	.4	1,053
53. Tantalum Group	LB Ta Metal	7,160,000	2,426,387	149.9	4,733,613
	LB Ta	0	28,688	4.7	1
	LB Ta	0	201,133	44.2	1
	LB Ta	8,400,000	2,584,195	101.0	1
54. Thorium Nitrate	LB	600,000	7,131,812	19.6	6,531,812
55. Tin	MT	42,700	189,154	2,335.3	146,454
56. Titanium Sponge	ST	195,000	32,331	353.4	162,669
57. Tungsten Group	LB W Metal	50,666,000	75,925,499	505.4	25,259,499
	LB W	2,000,000	2,032,942	23.3	1
	LB W	0	2,025,361	24.8	1
	LB W	1,600,000	1,898,831	24.5	1
	LB W	55,450,000	82,218,996	432.8	1
58. Vanadium Group	ST V Metal	8,700	541	6.5	8,159
	ST V	1,000	0	1	1,000
	ST V	7,700	541	6.5	7,159
59. Vegetable Tannin Extract, Chestnut	LT	5,000	13,677	9.3	8,677
60. Vegetable Tannin Extract, Quebracho	LT	28,000	130,441	89.1	102,441
61. Vegetable Tannin Extract, Wattle	LT	15,000	15,001	10.6	1
62. Zinc	ST	1,425,000	378,316	343.4	1,046,684

Table 2 (continued)

Footnotes

a. Bauxite, Metal Grade, Jamaica Type: Includes 400,000 LDT in the physical custody of GSA, title to which will be transferred to the Stockpile during Fiscal Years 1988-1990.

b. Aluminum Oxide, Fused Crude: Hold 50,904 ST of aluminum oxide abrasive grain and 249,867 ST of aluminum oxide fused crude as offset against 379,253 LCT of bauxite abrasive grade.

c. Chromium Group, Chemical and Metallurgical Grades: Metallurgical grade ore goal is 3,200,000 ST of specification grade; inventory 1,956,824 ST; shortfall 1,243,176 ST.

- (1) Hold 217,695 ST of Fe Cr high carbon against shortfall of 544,238 ST of specification grade ore.
- (2) Hold 243,892 ST of Fe Cr low carbon against 609,730 ST of specification grade ore.
- (3) Hold 89,208 ST of nonspecification grade metallurgical ore against the balance of the 89,208 ST specification grade ore shortfall.
- (4) Hold 47,466 ST of nonspecification grade metallurgical ore against a shortfall of 31,544 ST of Fe Cr Si.
- (5) Hold 56,830 ST of nonspecification grade metallurgical ore against a shortfall of 16,237 ST of chromium metal.
- (6) Hold 337,715 ST of nonspecification grade metallurgical ore against 337,715 ST of chemical grade ore shortfall.

d. Columbium Group:

- (1) Hold 930,911 pounds Cb as Fe Cb against 1,095,189 pounds Cb as concentrates.
- (2) Hold 44,851 lb Cb as Cb metal against 52,766 lb Cb as concentrates.

e. Manganese, Dioxide, Battery Grade Group:

Hold 21,989 ST of manganese, battery grade, natural ore against a shortfall of 21,989 ST of manganese, battery grade, synthetic dioxide.

f. Manganese Group, Chemical and Metallurgical Grades: Metallurgical grade ore goal is 2,700,000 ST; inventory 2,409,160 ST; shortfall 290,840 ST of stockpile grade ore.

- (1) Hold 14,172 ST of Mn metal against 35,430 ST of metallurgical ore.
- (2) Hold 23,574 ST of Fe Mn Si against 42,433 ST of metallurgical ore.
- (3) Hold 28,920 ST of Fe Mn medium carbon against 57,840 ST of metallurgical ore.
- (4) Hold 77,569 ST of Fe Mn high carbon against 155,138 ST of metallurgical ore.
- (5) Hold remaining 83,409 ST of Fe Mn high carbon against reduction of ore value in desired inventory mix.

g. Opium: Hold 31,795 AMA lb of opium gum against 31,795 AMA lb of opium salt goal.

h. Ricinoleic/Sebacic Acid Products: Sebacic acid inventory is credited toward goal at the rate of 2.5 to 1.

i. Tantalum Group:

- (1) Hold 201,133 lb Ta as Ta metal against 237,337 lb Ta as concentrates.
- (2) Hold 28,688 lb Ta as Ta C against 33,852 lb Ta as concentrates.

j. Tungsten Group:

- (1) WC powder goal is 2,000,000 lb W; stockpile grade inventory 1,921,167 lb W; shortfall 78,833 lb W. Hold 111,775 lb W as nonspecification grade WC to offset 78,243 lb W as WC specification grade (assume 70% recovery of usable W).
- (2) W metal powder goal is 1,600,000 lb W; inventory stockpile grade 1,566,944 lb W; shortfall 33,036 lb W. Nonstockpile grade W metal powder inventory is 331,947 lb W. Assume 70% recovery as usable material, then $331,947 \times .70 = 232,363$ lb W. Hold 47,194 lb W as nonspecification grade powder to offset shortfall of 33,036 stockpile grade W powder.
- (3) Hold balance of nonstockpile grade W powder 232,363 - 33,036 = 199,327 lb W as powder against 234,209 lb W as concentrate.
- (4) Hold 840,752 lbs W as Fe W stockpile grade against 987,884 lb W as concentrate. Hold 1,184,609 lb W nonstockpile grade Fe W at 70 percent recoverable against 974,341 lb W concentrate.

APPENDIX 2

CALCULATION PROCEDURE FOR FAMILY GROUPINGS OF MATERIALS

The following example is designed to help the reader perform and understand the conversions and calculations used in preparing summary lines for basic family groupings. The purpose in using basic units for each of the families or groups of materials is to place the content of the primary material into a common denominator for easier comparison.

In time of emergency, there would be a need for a mix of various forms of each metal element. The stockpile goal for a metal is a mix of products at various stages of upgrading. The goal is calculated by examining expected wartime requirements, availability, and domestic capacity to produce each of the upgraded forms.

There is a different factor for converting each of the forms into a common denominator, usually the basic metal equivalent. The conversion factors are different because process conversion losses vary. The calculations and conversions used for the aluminum oxide abrasive grain group are shown as an example.

The aluminum oxide abrasive grain group has a surplus of aluminum oxide abrasive grain and of aluminum oxide fused crude but has a deficit of bauxite abrasive grade. Both aluminum oxide abrasive grain and fused crude are used to offset the shortfall in the abrasive grade bauxite but in different proportions for each because of upgrading processing losses.

PROCEDURE

1. Both aluminum oxide abrasive grain and aluminum oxide fused crude are upgraded products of abrasive grain bauxite. In converting each of these materials from bauxite a process loss was incurred. Therefore, to use them as offsets against the deficit in abrasive grade bauxite, conversion factors greater than 1.0 are used to convert them back to equivalent amounts of bauxite.
2. The available surplus of aluminum oxide abrasive grain is 50,904 ST. To calculate the abrasive grade bauxite equivalent in LCT, multiply by the conversion factor: 1.55999 times 50,904 equals 79,410 LCT of bauxite equivalent.
3. The available surplus aluminum oxide fused crude is 249,867 ST. To convert this into bauxite equivalent in LCT, multiply by the conversion factor: 1.200 times 249,867 equals 299,840 LCT bauxite equivalent.
4. Add the two bauxite equivalents to find the total offset; 79,410 plus 299,840 equals 379,250 LCT.
5. The bauxite abrasive grade goal is 1,000,000 LCT; therefore subtract the offset of 379,250 LCT leaving a deficit of 620,750 LCT.

Factors Used for Converting Materials Into Family Groups

Materials	Unit	Multiple Factor	Basic Family Unit
Alumina	ST	0.518	Metal Equivalent, Aluminum
Aluminum Oxide, Fused, Crude	ST	0.833	Aluminum Oxide, Abrasive Grain
Bauxite, Abrasive Grade	LCT	0.641	Aluminum Oxide, Abrasive Grain S.T.
Bauxite, Metal Grade, Jamaica Type . .	ST	0.231	Metal Equivalent, Aluminum
Bauxite, Metal Grade, Surinam Type . .	ST	0.264	Metal Equivalent, Aluminum
Beryl Ore (11% BeO)	ST	0.028	Metal Equivalent, Beryllium
Beryllium Copper Master Alloy (4% Be)	ST	0.04	Metal Equivalent, Beryllium
Chromite, Chemical Grade Ore	ST	0.286	Metal Equivalent, Chromium
Chromite, Metallurgical Grade Ore	ST	0.286	Metal Equivalent, Chromium
Chromium, Ferro, High Carbon	ST	0.714	Metal Equivalent, Chromium
Chromium, Ferro, Low Carbon	ST	0.714	Metal Equivalent, Chromium
Chromium, Ferro, Silicon	ST	0.429	Metal Equivalent, Chromium
Columbium, Concentrates	LB	0.850	Metal Equivalent, Columbium
Diamond Dies, Small	PC	0.50	Carat
Manganese, Dioxide, Battery Grade . .	SDT	1.000	Manganese, Dioxide, Battery Grade, Synthetic
Manganese, Chemical Grade	ST	0.400	Metal Equivalent, Manganese
Manganese, Metallurgical Grade	ST	0.400	Metal Equivalent, Manganese
Manganese, Ferro, High Carbon	ST	0.800	Metal Equivalent, Manganese
Manganese, Ferro, Medium Carbon . . .	ST	0.800	Metal Equivalent, Manganese
Manganese, Ferro, Silicon	ST	0.720	Metal Equivalent, Manganese
Opium Gum	AMA LB	1.000	Opium Salts
Tantalum Minerals	LB	0.85	Metal Equivalent, Tantalum
Tungsten Ores and Concentrates	LB	0.851	Metal Equivalent, Tungsten

APPENDIX 3

STRATEGIC AND CRITICAL MATERIALS STOCK PILING ACT (P.L. 96-41, 50 U.S.C. 98 et seq.) as of September 30, 1984

SEC. 1. This Act may be cited as the 'Strategic and Critical Materials Stock Piling Act'.

FINDINGS AND PURPOSE

SEC. 2. (a) The Congress finds that the natural resources of the United States in certain strategic and critical materials are deficient or insufficiently developed to supply the military, industrial, and essential civilian needs of the United States for national defense.

(b) It is the purpose of this Act to provide for the acquisition and retention of stocks of certain strategic and critical materials and to encourage the conservation and development of sources of such materials within the United States and thereby to decrease and to preclude, when possible, a dangerous and costly dependence by the United States upon foreign sources for supplies of such materials in times of national emergency.

MATERIALS TO BE ACQUIRED: PRESIDENTIAL AUTHORITY AND GUIDELINES

SEC. 3. (a) The President shall determine from time to time (1) which materials are strategic and critical materials for the purposes of this Act, and (2) the quality and quantity of each such material to be acquired for the purposes of this Act and the form in which each such material shall be acquired and stored. Such materials when acquired, together with the other materials described in section 4 of this Act, shall constitute and be collectively known as the National Defense Stockpile (hereinafter in this Act referred to as the 'stockpile').

(b) The President shall make the determinations required to be made under subsection (a) on the basis of the following principles:

(1) The purpose of the stockpile is to serve the interest of national defense only and is not to be used for economic or budgetary purposes.

(2) The quantities of the materials stockpiled should be sufficient to sustain the United

States for a period of not less than three years in the event of a national emergency.

(c) The quantity of any material to be stockpiled under this Act, as determined under subsection (a), may not be revised unless the Committees on Armed Services of the Senate and House of Representatives are notified in writing of the proposed revision and the reasons for such revision at least 30 days before the effective date of such revision.

MATERIALS CONSTITUTING THE NATIONAL DEFENSE STOCKPILE

SEC. 4. (a) The stockpile consists of the following materials:

(1) Materials acquired under this Act and contained in the national stockpile on the day before the date of the enactment of the Strategic and Critical Materials Stock Piling Revision Act of 1979.

(2) Materials acquired under this Act on or after the date of the enactment of the Strategic and Critical Materials Stock Piling Revision Act of 1979.

(3) Materials in the supplemental stockpile established by section 104(b) of the Agricultural Trade Development and Assistance Act of 1954 (as in effect from September 21, 1959, through December 31, 1966) on the day before the date of the enactment of the Strategic and Critical Materials Stock Piling Revision Act of 1979.

(4) Materials acquired by the United States under the provisions of section 303 of the Defense Production Act of 1950 (50 U.S.C. App. 2093) and transferred to the stockpile by the President pursuant to subsection (f) of such section.

(5) Materials transferred to the United States under section 663 of the Foreign Assistance Act of 1961 (22 U.S.C. 2423) that have been determined to be strategic and critical materials for the purposes of this Act and that are allocated by the President under subsection (b) of such section for stockpiling in the stockpile.

(6) Materials acquired by the Commodity Credit Corporation and transferred to the stockpile under section 4(h) of the Commodity Credit Corporation Charter Act (15 U.S.C. 714b(h)).

(7) Materials acquired by the Commodity Credit Corporation under paragraph (2) of section 103(a) of the Act entitled 'An Act to provide for greater stability in agriculture; to augment the marketing and disposal of agricultural products; and for other purposes', approved August 28, 1954 (7 U.S.C. 1743(a)), and transferred to the stockpile under the third sentence of such section.

(8) Materials transferred to the stockpile by the President under paragraph (4) of section 103(a) of such Act of August 28, 1954.

(9) Materials transferred to the stockpile under subsection (b).

(b) Notwithstanding any other provision of law, any material that (1) is under the control of any department or agency of the United States, (2) is determined by the head of such department or agency to be excess to its needs and responsibilities, and (3) is required for the stockpile shall be transferred to the stockpile. Any such transfer shall be made without reimbursement to such department or agency, but all costs required to effect such transfer shall be paid or reimbursed from funds appropriated to carry out this Act.

AUTHORITY FOR STOCKPILE OPERATIONS

SEC. 5. (a) (1) Except for acquisitions made under the authority of paragraph (3) or (4) of section 6(a), no funds may be obligated or appropriated for acquisition of any material under this Act unless funds for such acquisition have been authorized by law. Funds appropriated for such acquisition (and for transportation and other incidental expenses related to such acquisition) shall remain available until expended, unless otherwise provided in appropriation Acts.

(2) If for any fiscal year the President proposes certain stockpile transactions in the annual materials plan submitted to Congress for that year under section 11(b) and after that plan is submitted the President proposes (or Congress requires) a significant change in any such transaction, or a significant

transaction not included in such plan, no amount may be obligated or expended for such transaction during such year until the President has submitted a full statement of the proposed transaction to the appropriate committees of Congress and a period of 30 days has passed from the date of the receipt of such statement by such committees or until each such committee, before the expiration of such period, notifies the President that it has no objection to the proposed transaction. In computing any 30-day period for the purpose of the preceding sentence, there shall be excluded any day on which either House of Congress is not in session because of an adjournment of more than three days to a day certain.

(b) Except for disposals made under the authority of paragraph (4) or (5) of section 6(a) or under section 7(a), no disposal may be made from the stockpile (1) unless such disposal, including the quantity of the material to be disposed of, has been specifically authorized by law, or (2) if the disposal would result in there being a balance in the National Defense Stockpile Transaction Fund in excess of \$1,000,000,000 or, in the case of a disposal to be made after September 30, 1983, if the disposal would result in there being a balance in the fund in excess of \$500,000,000.

(c) There is authorized to be appropriated such sums as may be necessary to provide for the transportation, processing, refining, storage, security, maintenance, rotation, and disposal of materials contained in or acquired for the stockpile. Funds appropriated for such purposes shall remain available to carry out the purposes for which appropriated for a period of two fiscal years, if so provided in appropriation Acts.

STOCKPILE MANAGEMENT

SEC. 6. (a) The President shall—

(1) acquire the materials determined under section 3(a) to be strategic and critical materials;

(2) provide for the proper storage, security, and maintenance of materials in the stockpile;

(3) provide for the refining or processing of any material in the stockpile when necessary to convert such material into the form most suitable for storage and subsequent disposition;

(4) provide for the rotation of any material in the stockpile when necessary to prevent deterioration of such material by replacement of such material with an equivalent quantity of substantially the same material;

(5) subject to the notification required by subsection (d)(2), provide for the timely disposal of materials in the stockpile that (A) are excess to stockpile requirements, and (B) may cause a loss to the Government if allowed to deteriorate; and

(6) subject to the provisions of section 5(b), dispose of materials in the stockpile the disposal of which is specifically authorized by law.

(b) Except as provided in subsections (c) and (d), acquisition of strategic and critical materials under this Act shall be made in accordance with established Federal procurement practices, and, except as provided in subsections (c) and (d) and in section 7(a), disposal of materials from the stockpile shall be made by formal advertising or competitive negotiation procedures. To the maximum extent feasible—

(1) competitive procedures shall be used in the acquisition and disposal of such materials;

(2) efforts shall be made in the acquisition and disposal of such materials to avoid undue disruption of the usual markets of producers, processors, and consumers of such materials and to protect the United States against avoidable loss; and

(3) disposal of such materials shall be made for domestic consumption.

(c)(1) The President shall encourage the use of barter in the acquisition of strategic and critical materials for, and the disposal of materials from, the stockpile when acquisition or disposal by barter is authorized by law and is practical and in the best interest of the United States.

(2) Materials in the stockpile, the disposition of which is authorized by law, shall be available for transfer at fair market value as payment for expenses (including transportation and other incidental expenses) of acquisition of materials, or of refining, processing, or rotating materials, under this Act.

(3) To the extent otherwise authorized by law, property owned by the United States may be bartered for materials needed for the stockpile.

(d)(1) The President may waive the applicability of any provision of the first sentence of subsection (b) to any acquisition of material for, or disposal of material from, the stockpile. Whenever the President waives any such provision with respect to any such acquisition or disposal, or whenever the President determines that the application of paragraph (1), (2), or (3) of such subsection to a particular acquisition or disposal is not feasible, the President shall notify the Committees on Armed Services of the Senate and House of Representatives in writing of the proposed acquisition or disposal at least thirty days before any obligation of the United States is incurred in connection with such acquisition or disposal and shall include in such notification the reasons for not complying with any provision of such subsection.

(2) Materials in the stockpile may be disposed of under subsection (a)(5) only if the Committees on Armed Services of the Senate and House of Representatives are notified in writing of the proposed disposal at least thirty days before any obligation of the United States is incurred in connection with such disposal.

(e) The President may acquire leasehold interests in property, for periods not in excess of twenty years, for storage, security, and maintenance of materials in the stockpile.

SPECIAL DISPOSAL AUTHORITY OF THE PRESIDENT

SEC. 7. (a) Materials in the stockpile may be released for use, sale, or other disposition—

(1) on the order of the President, at any time the President determines the release of such materials is required for purposes of the national defense; and

(2) in time of war declared by the Congress or during a national emergency, on the order of any officer or employee of the United States designated by the President to have authority to issue disposal orders under this subsection, if such officer or employee determines that the release of such materials is required for purposes of the national defense.

(b) Any order issued under subsection (a) shall be promptly reported by the President, or by the officer or employee issuing such order, in writing, to the

(6) Materials acquired by the Commodity Credit Corporation and transferred to the stockpile under section 4(h) of the Commodity Credit Corporation Charter Act (15 U.S.C. 714b(h)).

(7) Materials acquired by the Commodity Credit Corporation under paragraph (2) of section 103(a) of the Act entitled 'An Act to provide for greater stability in agriculture; to augment the marketing and disposal of agricultural products; and for other purposes', approved August 28, 1954 (7 U.S.C. 1743(a)), and transferred to the stockpile under the third sentence of such section.

(8) Materials transferred to the stockpile by the President under paragraph (4) of section 103(a) of such Act of August 28, 1954.

(9) Materials transferred to the stockpile under subsection (b).

(b) Notwithstanding any other provision of law, any material that (1) is under the control of any department or agency of the United States, (2) is determined by the head of such department or agency to be excess to its needs and responsibilities, and (3) is required for the stockpile shall be transferred to the stockpile. Any such transfer shall be made without reimbursement to such department or agency, but all costs required to effect such transfer shall be paid or reimbursed from funds appropriated to carry out this Act.

AUTHORITY FOR STOCKPILE OPERATIONS

SEC. 5. (a) (1) Except for acquisitions made under the authority of paragraph (3) or (4) of section 6(a), no funds may be obligated or appropriated for acquisition of any material under this Act unless funds for such acquisition have been authorized by law. Funds appropriated for such acquisition (and for transportation and other incidental expenses related to such acquisition) shall remain available until expended, unless otherwise provided in appropriation Acts.

(2) If for any fiscal year the President proposes certain stockpile transactions in the annual materials plan submitted to Congress for that year under section 11(b) and after that plan is submitted the President proposes (or Congress requires) a significant change in any such transaction, or a significant

transaction not included in such plan, no amount may be obligated or expended for such transaction during such year until the President has submitted a full statement of the proposed transaction to the appropriate committees of Congress and a period of 30 days has passed from the date of the receipt of such statement by such committees or until each such committee, before the expiration of such period, notifies the President that it has no objection to the proposed transaction. In computing any 30-day period for the purpose of the preceding sentence, there shall be excluded any day on which either House of Congress is not in session because of an adjournment of more than three days to a day certain.

(b) Except for disposals made under the authority of paragraph (4) or (5) of section 6(a) or under section 7(a), no disposal may be made from the stockpile (1) unless such disposal, including the quantity of the material to be disposed of, has been specifically authorized by law, or (2) if the disposal would result in there being a balance in the National Defense Stockpile Transaction Fund in excess of \$1,000,000,000 or, in the case of a disposal to be made after September 30, 1983, if the disposal would result in there being a balance in the fund in excess of \$500,000,000.

(c) There is authorized to be appropriated such sums as may be necessary to provide for the transportation, processing, refining, storage, security, maintenance, rotation, and disposal of materials contained in or acquired for the stockpile. Funds appropriated for such purposes shall remain available to carry out the purposes for which appropriated for a period of two fiscal years, if so provided in appropriation Acts.

STOCKPILE MANAGEMENT

SEC. 6. (a) The President shall—

(1) acquire the materials determined under section 3(a) to be strategic and critical materials;

(2) provide for the proper storage, security, and maintenance of materials in the stockpile;

(3) provide for the refining or processing of any material in the stockpile when necessary to convert such material into the form most suitable for storage and subsequent disposition;

(4) provide for the rotation of any material in the stockpile when necessary to prevent deterioration of such material by replacement of such material with an equivalent quantity of substantially the same material;

(5) subject to the notification required by subsection (d)(2), provide for the timely disposal of materials in the stockpile that (A) are excess to stockpile requirements, and (B) may cause a loss to the Government if allowed to deteriorate; and

(6) subject to the provisions of section 5(h), dispose of materials in the stockpile the disposal of which is specifically authorized by law.

(b) Except as provided in subsections (c) and (d), acquisition of strategic and critical materials under this Act shall be made in accordance with established Federal procurement practices, and, except as provided in subsections (c) and (d) and in section 7(a), disposal of materials from the stockpile shall be made by formal advertising or competitive negotiation procedures. To the maximum extent feasible—

(1) competitive procedures shall be used in the acquisition and disposal of such materials;

(2) efforts shall be made in the acquisition and disposal of such materials to avoid undue disruption of the usual markets of producers, processors, and consumers of such materials and to protect the United States against avoidable loss; and

(3) disposal of such materials shall be made for domestic consumption.

(c)(1) The President shall encourage the use of barter in the acquisition of strategic and critical materials for, and the disposal of materials from, the stockpile when acquisition or disposal by barter is authorized by law and is practical and in the best interest of the United States.

(2) Materials in the stockpile, the disposition of which is authorized by law, shall be available for transfer at fair market value as payment for expenses (including transportation and other incidental expenses) of acquisition of materials, or of refining, processing, or rotating materials, under this Act.

(3) To the extent otherwise authorized by law, property owned by the United States may be bartered for materials needed for the stockpile.

(d)(1) The President may waive the applicability of any provision of the first sentence of subsection (b) to any acquisition of material for, or disposal of material from, the stockpile. Whenever the President waives any such provision with respect to any such acquisition or disposal, or whenever the President determines that the application of paragraph (1), (2), or (3) of such subsection to a particular acquisition or disposal is not feasible, the President shall notify the Committees on Armed Services of the Senate and House of Representatives in writing of the proposed acquisition or disposal at least thirty days before any obligation of the United States is incurred in connection with such acquisition or disposal and shall include in such notification the reasons for not complying with any provision of such subsection.

(2) Materials in the stockpile may be disposed of under subsection (a)(5) only if the Committees on Armed Services of the Senate and House of Representatives are notified in writing of the proposed disposal at least thirty days before any obligation of the United States is incurred in connection with such disposal.

(e) The President may acquire leasehold interests in property, for periods not in excess of twenty years, for storage, security, and maintenance of materials in the stockpile.

SPECIAL DISPOSAL AUTHORITY OF THE PRESIDENT

SEC. 7. (a) Materials in the stockpile may be released for use, sale, or other disposition—

(1) on the order of the President, at any time the President determines the release of such materials is required for purposes of the national defense; and

(2) in time of war declared by the Congress or during a national emergency, on the order of any officer or employee of the United States designated by the President to have authority to issue disposal orders under this subsection, if such officer or employee determines that the release of such materials is required for purposes of the national defense.

(b) Any order issued under subsection (a) shall be promptly reported by the President, or by the officer or employee issuing such order, in writing, to the

Committees on Armed Services of the Senate and House of Representatives.

MATERIALS DEVELOPMENT AND RESEARCH

SEC. 8. (a)(1) The President shall make scientific, technologic, and economic investigations concerning the development, mining, preparation, treatment, and utilization of ores and other mineral substances that (A) are found in the United States, or in its territories or possessions, (B) are essential to the national defense, industrial, and essential civilian needs of the United States, and (C) are found in known domestic sources in inadequate quantities or grades.

(2) Such investigations shall be carried out in order to—

(A) determine and develop new domestic sources of supply of such ores and mineral substances;

(B) devise new methods for the treatment and utilization of lower grade reserves of such ores and mineral substances; and

(C) develop substitutes for such essential ores and mineral products.

(3) Investigations under paragraph (1) may be carried out on public lands and, with the consent of the owner, on privately owned lands for the purpose of exploring and determining the extent and quality of deposits of such minerals, the most suitable methods of mining and beneficiating such minerals, and the cost at which the minerals or metals may be produced.

(b) The President shall make scientific, technologic, and economic investigations of the feasibility of developing domestic sources of supplies of any agricultural material or for using agricultural commodities for the manufacture of any material determined pursuant to section 3(a) of this Act to be a strategic and critical material or substitutes therefor.

NATIONAL DEFENSE STOCKPILE TRANSACTION FUND

SEC. 9. (a) There is established in the Treasury of the United States a separate fund to be known as

the National Defense Stockpile Transaction Fund (hereinafter in this section referred to as the 'fund').

(b)(1) All moneys received from the sale of materials in the stockpile under paragraphs (5) and (6) of section 6(a) shall be covered into the fund. Such moneys shall remain in the fund until appropriated.

(2) Moneys covered into the fund under paragraph (1) shall be available, when appropriated therefor, only for the acquisition of strategic and critical materials under section 6(a)(1) of this Act (and for transportation related to such acquisition).

(3) Moneys in the fund, when appropriated, shall remain available until expended, unless otherwise provided in appropriation Acts.

(c) All moneys received from the sale of materials being rotated under the provisions of section 6(a)(4) or disposed of under section 7(a) shall be covered into the fund and shall be available only for the acquisition of replacement materials.

ADVISORY COMMITTEES

SEC. 10. (a) The President may appoint advisory committees composed of individuals with expertise relating to materials in the stockpile or with expertise in stockpile management to advise the President with respect to the acquisition, transportation, processing, refining, storage, security, maintenance, rotation, and disposal of such materials under this Act.

(b) Each member of an advisory committee established under subsection (a) while serving on the business of the advisory committee away from such member's home or regular place of business shall be allowed travel expenses, including per diem in lieu of substance, as authorized by section 5703 of title 5, United States Code, for persons intermittently employed in the Government service.

REPORTS TO CONGRESS

SEC. 11.(a) The President shall submit to the Congress every six months a written report detailing operations under this Act. Each such report shall include—

(1) information with respect to foreign and domestic purchases of materials during the preceding 6-month period;

(2) information with respect to the acquisition and disposal of materials under this Act by barter, as provided for in section 6(c) of this Act, during such period;

(3) a statement and explanation of the financial status of the National Defense Stockpile Transaction Fund and the anticipated appropriations to be made from the fund during the next fiscal year; and

(4) such other pertinent information on the administration of this Act as will enable the Congress to evaluate the effectiveness of the program provided for under this Act and to determine the need for additional legislation.

(b) The President shall submit to the appropriate committees of the Congress each year with the Budget submitted to Congress pursuant to Section 201(a) of the Budget and Accounting Act, 1921 (31 U.S.C. 11(a)), for the next fiscal year a report containing an annual materials plan for the operation of the stockpile during such fiscal year and the succeeding four fiscal years. Each such report shall include details of planned expenditures for acquisition of strategic and critical materials during such period (including expenditures to be made from appropriations from the general fund of the Treasury) and of anticipated receipts from proposed disposals of stockpile materials during such period.

DEFINITIONS

SEC. 12. For the purposes of this Act:

(1) The term 'strategic and critical materials' means materials that (A) would be needed to supply the military, industrial, and essential civilian needs of the United States during a national emergency, and (B) are not found or produced in the United States in sufficient quantities to meet such need.

(2) The term 'national emergency' means a general declaration of emergency with respect to the national defense made by the President or by the Congress.

SEC. 13. Notwithstanding any other provision of law, on and after January 1, 1972, the President may not prohibit or regulate the importation into the United States of any material determined to be strategic and critical pursuant to the provisions of this Act, if such material is the product of any foreign country or area not listed as a Communist-dominated country or area in general headnote 3(d) of the Tariff Schedules of the United States (19 U.S.C. 1202), for so long as the importation into the United States of material of that kind which is the product of such Communist-dominated countries or areas is not prohibited by any provision of law.